DaqBoard/1000 and /2000 Series User's Manual

For PCI-bus & Compact PCI-bus Data Acquisition Boards

Measurement Computing
10 Commerce Way
Norton, MA 02766

(508) 946-5100
Fax: (508) 946-9500
info@mccdaq.com
www.mccdaq.com

DaqBoard/1000 & /2000 Series
User's Manual

For PCI-bus & Compact PCI-bus
Data Acquisition Boards

p/n **1033-0901** Rev. **8.0**

© 1999 through 2005 by Measurement Computing Corp. 889094 Printed in the United States of America

Warranty Information

Contact Measurement Computing by phone, fax, or e-mail in regard to warranty-related issues:
Phone: (508) 946-5100, fax: (508) 946-9500, e-mail: info@mccdaq.com

Limitation of Liability

Measurement Computing cannot be held liable for any damages resulting from the use or misuse of this product.

Copyright, Trademark, and Licensing Notice

All Measurement Computing documentation, software, and hardware are copyright with all rights reserved. No part of this product may be copied, reproduced or transmitted by any mechanical, photographic, electronic, or other method without Measurement Computing's prior written consent. IOtech product names are trademarked; other product names, as applicable, are trademarks of their respective holders. All supplied IOtech software (including miscellaneous support files, drivers, and sample programs) may only be used on one installation. You may make archival backup copies.

CE Notice

Many Measurement Computing products carry the CE marker indicating they comply with the safety and emissions standards of the European Community. When applicable these products have a Declaration of Conformity stating which specifications and operating conditions apply. You can view the Declarations of Conformity at www.mccdaq.com/legal.aspx (CE Information page).

Warnings, Cautions, Notes, and Tips

Refer all service to qualified personnel. This caution symbol warns of possible personal injury or equipment damage under noted conditions. Follow all safety standards of professional practice and the recommendations in this manual. Using this equipment in ways other than described in this manual can present serious safety hazards or cause equipment damage.

This warning symbol is used in this manual or on the equipment to warn of possible injury or death from electrical shock under noted conditions.

This ESD caution symbol urges proper handling of equipment or components sensitive to damage from electrostatic discharge. Proper handling guidelines include the use of grounded anti-static mats and wrist straps, ESD-protective bags and cartons, and related procedures.

This symbol indicates the message is important, but is not of a Warning or Caution category. These notes can be of great benefit to the user, and should be read.

In this manual, the book symbol always precedes the words "Reference Note." This type of note identifies the location of additional information that may prove helpful. References may be made to other chapters or other documentation.

Tips provide advice that may save time during a procedure, or help to clarify an issue. Tips may include additional reference.

Specifications and Calibration

Specifications are subject to change without notice. Significant changes will be addressed in an addendum or revision to the manual. As applicable, the hardware is calibrated to published specifications. Periodic hardware calibration is not covered under the warranty and must be performed by qualified personnel as specified in this manual. Improper calibration procedures may void the warranty.

Your order was carefully inspected prior to shipment. When you receive your system, carefully unpack all items from the shipping carton and check for physical signs of damage that may have occurred during shipment. Promptly report any damage to the shipping agent and your sales representative. Retain all shipping materials in case the unit needs returned to the factory.

CAUTION

Using this equipment in ways other than described in this manual can cause personal injury or equipment damage. Before setting up and using your equipment, you should read *all* documentation that covers your system. Pay special attention to Warnings and Cautions.

Note: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Initial navigation is as follows:

Start [Desktop "Start" pull-down menu]
⇒ **Programs**
⇒ **IOtech DaqX Software**

You can also access the PDF documents directly from the data acquisition CD by using the <**View PDFs**> button located on the opening screen.

Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

PDF
1033-0901

DaqBoard 1000 and 2000 Series.pdf

Contains the DaqBoard/1000 and /2000 Series hardware-related and software-related chapters, as well as links to the .pdf files listed below. This pdf file, plus the following constitute a complete set of documentation for the DaqBoards discussed. Note that the Programmer's Manual (1008-0901) and the DBK Option Cards & Modules
(457-0905) are completely separate documents. The later does not apply to DaqBoard/1000 Series boards.

PDF
457-0909

DaqView.pdf

Discusses how to install and use this "out-of-the-box" data acquisition program.

PDF
1086-0926
1086-0922

PostAcquisition Analysis.pdf

This pdf consists of two documents. The first discusses *eZ-PostView*, a post data acquisition analysis program. The application is included free as a part of DaqTemp product support. The second includes information regarding *eZ-FrequencyView* and *eZ-TimeView*. These two applications have more features than does *eZ-PostView* and are available for purchase. They can; however, be used freely during a 30-day trial period.

PDF
457-0905

DBK Options.pdf

The DBK Option Cards and Modules Manual discusses each of the DBK products available at the time of print. The DBK Options document does not apply to DaqBoard/1000 Series boards.

PDF
1008-0901

Programmers Manual.pdf

The programmer's manual pertains to developing custom programs using Applications Program Interface (API) commands.

Programmers should check the **readme.file** on the install CD-ROM for the location of program examples included on the CD.

DaqBoard/1000 and /2000 Series, Installation Guide (p/n 1033-0940)

DaqBoard/2000c Series, Installation Guide (p/n 1061-0940)

Chapter 1 – *Daq Systems and Device Overviews*. This chapter begins with a discussion of the "modular concept" that is associated with Daq data acquisition systems. The chapter then goes on to provide an overview for each DaqBoard/1000 and /2000 Series board.

Chapter 2 –*Connections and Pinouts, DaqBoard/1000 Series* - This chapter includes board pinouts for the DaqBoard/1000 Series 68-pin connector. It includes screw terminal identification for TB-100, which is an optional terminal board connector.

Chapter 3 - ***Connections and Pinouts, DaqBoard/2000 Series*** - This chapter includes board pinouts for the DaqBoard/2000 Series boards' 100-pin connector (P4). The chapter includes an overview of the DBK200 Series P4 adapters that can be used to obtain DB37 type connectors (P1, P2, and P3).

Chapter 4 - *CE Compliance* pertains to CE standards and conditions that are relevant to DaqBoard/1000 and /2000 Series boards. A CE Kit, which can be used for DaqBoard/2000 Series boards, is also discussed.

Chapter 5 - *Calibration* lists the order in which to perform calibration-related adjustments and briefly discusses ***DaqCal.exe***, a program that provides on-screen instruction, graphics, and prompts.

Chapter 6 – *Specifications, DaqBoard/1000 Series Boards*

Chapter 7 – *Specifications, DaqBoard/2000 Series Boards*

Glossary

Reference Notes:
During software installation, Adobe® PDF versions of user manuals are automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the Windows Desktop.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of manuals can be ordered from the factory.

- *DaqView and DaqViewXL* – explains the use and features of the included *out-of-the-box* data acquisition software.
- *Post Acquisition Data Analysis User's Guide* – discusses three post-acquisition data analysis programs: eZ-PostView, eZ-TimeView, and eZ-FrequencyView.
- For detailed information regarding specific DBKs, refer to the *DBK Option Cards and Modules User's Manual*, p/n 457-0905. Each DBK section includes device-specific hardware and software information. The document includes a chapter on power management. DaqBoard/1000 Series boards do not support DBK options.
- For programming-related information refer to the separate *Programmer's Manual*, p/n 1008-0901.

This page is intentionally blank.

Table of Contents

DaqBoard/1000 and /2000 Series, Installation Guide (p/n 1033-0940)
DaqBoard/2000c Series, Installation Guide (p/n 1061-0940)

1 – Daq Systems and Device Overviews

Daq Systems, the Modular Concept ……1-1
Theory of Operation, DaqBoard/1000 and/2000 Series Boards…… 1-3
Using DBK Cards & Modules for Signal Conditioning ……1-23
Note: DBK options do not apply to DaqBoard/1000 Series Boards
Daq Software …… 1-23

2 – Connections and Pinouts, DaqBoard/1000 Series

Overview …… 2-1
TB-100 Terminal Connector Option …… 2-2
Pinouts for DaqBoard/1000 Series Boards …… 2-3

3 – Connections and Pinouts, DaqBoard/2000 Series

Overview …… 3-1
DBK200 Series, P4 Connector Options …… 3-2
Pinouts for DaqBoard/2000 Series and /2000c Series Boards …… 3-8

4 – CE-Compliance

Overview …… 4-1
CE Standards and Directives …… 4-1
Safety Conditions …… 4-2
Emissions/Immunity Conditions …… 4-2
CE Enhancements for DBKs 4-3
CE Cable Kits for DaqBoard/2000 Series and /2000c Series Boards…… 4-3

5 – Calibration

6 – Specifications, DaqBoard/1000 Series Boards

7 – Specifications, DaqBoard/2000 Series Boards

Glossary

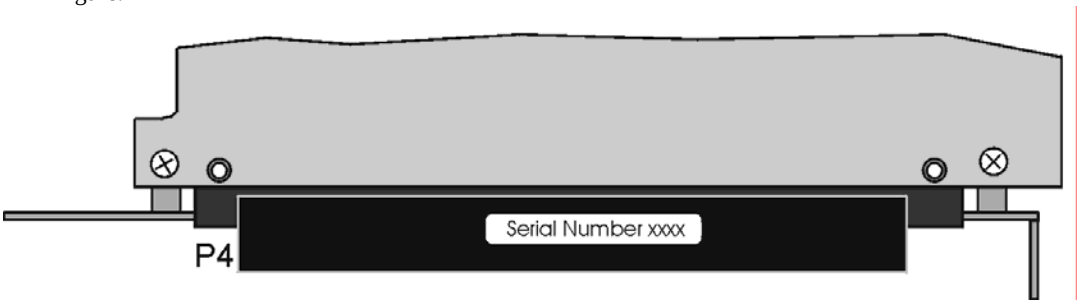
This page is intentionally blank.

This guide tells how to complete the following steps for a successful installation.

Step 1 – Install Software …… page 2
Step 2 – Install Boards in Available PCI Bus-Slots …… page 3
Step 3 – Configure Boards ….. page 5
Step 4 – Test Hardware ….. page 6

Reference Note:
After you have completed the installation you should refer to the electronic documents that were automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the Windows Desktop.

You should keep your DaqBoard's serial number and your DaqView/2000 authorization code (if applicable) with this document. Space is provided below for recording up to 4 board numbers and their PCI bus-slot locations. The board serial number is located on the connector as indicated in the following figure.



Serial Number Location on DaqBoard/2000 Series Connector
The location is similar for DaqBoard/1000 Series Board.

	Board Type (e.g., 1000, 1005, 2000, 2001, etc.)*	Serial Number	PCI Bus-Slot Location
Board 1			
Board 2			
Board 3			
Board 4			

The host PC can support up to four Boards.

***Note**: DaqBoards have device labels which read, for example, "DaqBoard/1000," "DaqBoard/2001," "DaqBoard/2002," etc. The name labels are convenient for users of more than one board type.

DaqView/2000 Authorization Code _____

Customers who ordered DaqView/2000 can find their authorization code on the *authorization code sheet* located inside the sleeve of the install CD. Note that earlier documents may refer to this as a "registration code" or "registration ID."

Customers who did not order DaqView/2000 can run a *30-day free trial version*, as discussed elsewhere in the User's Manual.

CAUTION

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

© 1999 through 2004 by Measurement Computing Corp.

Reference Notes:
(1) Each DaqBoard plugs into a PCI bus-slot. Consult your PC owner's manual as needed.

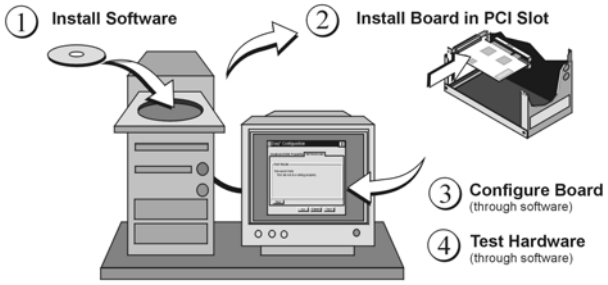
(2) DaqBoard/2000 Series users should read about the DBK cards and modules applicable to their acquisition system. Specific DBK information can be found in the world wide web at **http://www.daqboard.com**; and in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). After the install you can navigate to the DBK manual and other relevant electronic documents from your desktop as follows: **Start ⇒ Programs ⇒ IOtech DaqX Software ⇒ DaqBoard 2000 Series Users**

Note: DaqBoard/1000 Series boards do not support DBK options.

Reference Note: Adobe PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software. Note that hardcopy versions of the manuals can be ordered from the factory.

Minimum System Requirements

PC system with Pentium® Processor
Windows Operating System
RAM, as follows:
32 Mbytes of RAM for Windows 95/98/NT
64 Mbytes of RAM for Windows Me
64 Mbytes of RAM for Windows 2000
64 Mbytes of RAM for Windows XP



Installation, A Pictorial Overview

Step 1 – *Install Software*

IMPORTANT: Software must be installed before installing hardware.

1. Remove previous version Daq drivers, if present. You can do this through Microsoft's **Add/Remove Programs** feature.
2. Place the Data Acquisition CD into the CD-ROM drive. *Wait for PC to auto-run the CD. This may take a few moments, depending on your PC.* If the CD does not auto-run, use the Desktop's Start/Run/Browse feature and run the **Setup.exe** file.
3. After the intro-screen appears, follow the screen prompts.

   Upon completing the software installation, continue with step 2, *Install Boards in available PCI Bus-slots*.

Step 2 – Install Boards in available PCI Bus-slots

IMPORTANT: Software must be installed before installing hardware.

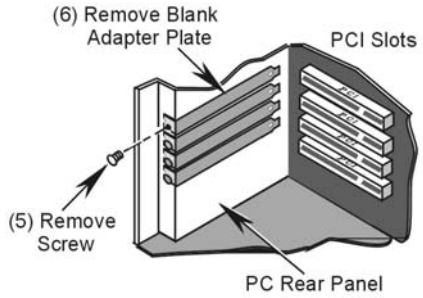
CAUTION
Turn off power to, and UNPLUG the host PC and externally connected equipment prior to removing the PC's cover and installing the DaqBoard. Electric shock or damage to equipment can result even under low-voltage conditions.
Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)
Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

IMPORTANT: Bus Mastering DMA *must be* Enabled.

For a DaqBoard/1000 or /2000 Series board to operate properly, Bus Mastering DMA *must be* Enabled on the PCI slot [for which the board is to be installed]. Prior to installation, verify that your computer is capable of performing Bus Mastering DMA for the applicable PCI slot. Note that some computers have BIOS settings that enable [or disable] Bus Mastering DMA. If your computer has this BIOS option, ensure that Bus Mastering DMA is *Enabled* on the appropriate PCI slot.

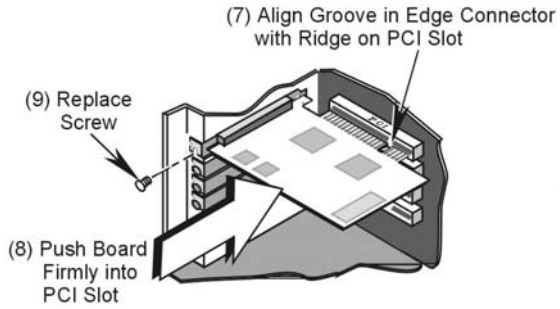
Refer to your PC Owner's Manual for additional information regarding your PC and enabling Bus Mastering DMA for PCI slots.

1. Turn **off** power to, and **UNPLUG the host PC** and externally connected equipment.
2. Remove the PC's cover. *Refer to your PC Owner's Manual as needed.*
3. Choose an available PCI bus-slot.
4. Carefully remove the DaqBoard from its anti-static protective bag. If you have not already done so, write down the serial number of your board at this time.
5. Refer to the figure at the right. Remove the screw that secures the blank adapter plate, which is associated with the PCI slot you will be using. *Refer to your PC Owner's Manual if needed.*
6. Remove the blank adapter plate.



Removing a Blank Adapter Plate

7. Refer to the figure at the right. Align the groove in the DaqBoard's PCI edge-connector with the ridge of the desired PCI slot, and with the PC's corresponding rear-panel slot.
8. Push the board firmly into the PCI slot. The board will snap into position.
9. Secure the board by inserting the rear-panel adapter-plate screw.
10. Using the previous steps, install additional boards into available PCI bus-slots, if applicable to your application.
11. Replace the computer's cover.
12. Plug in all cords and cables that were removed in step 1.
13. Apply power to, and start up the PC.

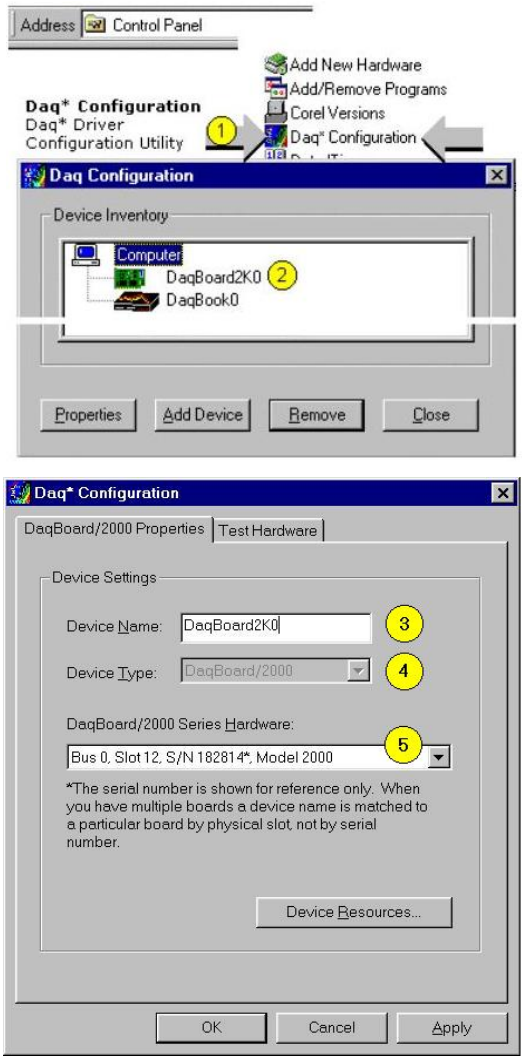


Installing a DaqBoard/2000 Series Board

Note: At this point some PCs may prompt you to insert an installation disk. While this is rare, if you do receive such a prompt simply place the install CD-ROM into the disk drive and follow additional screen prompts.

Step 3 – *Configure Boards*

DaqBoard/1000 and /2000 Series Boards have no jumpers or switches to set. Configuration is performed, in its entirety, through software. Refer to the following figure and steps to complete the configuration. The numbers in the figure correspond to the numbered steps immediately following the figure.



Accessing the DaqBoard/2000 Properties Tab
Note: Images are similar for DaqBoard/1000 Series.

1. Run the **Daq Configuration** control panel applet. Navigation from the desktop to the applet is as follows: **Start ⇒ Settings ⇒ Control Panel ⇒ Daq*Configuration** *(double-click)*
2. Double-click on the Device Inventory's DaqBoard2K0 or DaqBoard1K0 icon, as applicable. The DaqBoard's Properties tab will appear. **If the DaqBoard icon is not present, skip to the upcoming *Using 'Add Device'* section.**
3. Enter a "**Device Name**" in the text box, or use the default, e.g., DaqBoard2K0. The Name is for identifying the specific DaqBoard, but actually refers to the PCI slot.
4. Verify that the "Device Type" shows the correct board, e.g., "DaqBoard/1000, DaqBoard/2001, etc." Note that available device types can be viewed via the pull-down list.
5. Confirm that the DaqBoard's text box shows a **Bus #, Slot #,** and **Serial Number**.

   If this text box is empty, use its pull-down list and select the serial number that matches the one for your board.

Using "Add Device"

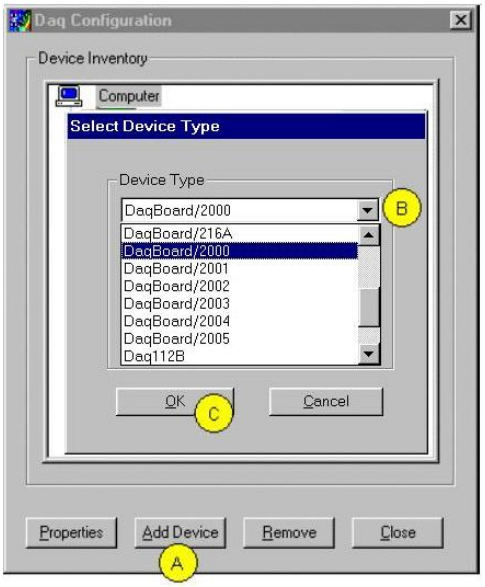
This method is for users who have accessed the **Daq Configuration** control panel applet, but have no DaqBoard1K icon or DaqBoard2K icon [as described on page IG-5, step 2].

(A) After accessing the Daq Configuration control panel applet, click on the <Add Device> button (see figure, right). The *Select Device Type* window will appear.

(B) Using the *Device Type's* pull-down list, select the applicable board. In the example at the right **DaqBoard/2000** is selected.

(C) Click the <**OK**> button. The board's Properties tab will appear. Note that this tab will apply to all boards in the series.

At this point, complete steps 3 through 5 from page IG-5.



Using "Add Device"

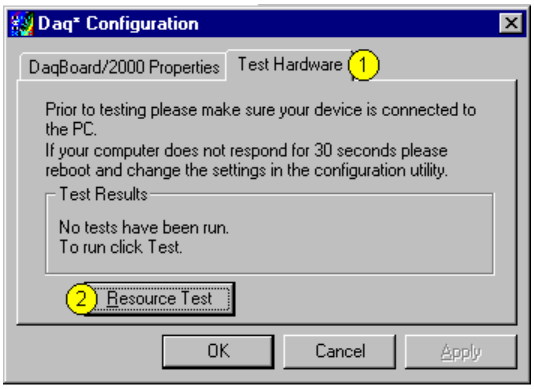
Step 4 – *Test Hardware*

Use the following steps to test the DaqBoard board. Note that these steps are continued from those listed under the previous section, "Configure Board."

1. Select the "**Test Hardware"** tab.
2. Click the "**Resource Test**" button.
3. After the test is complete, click "**OK**."

System capability is now tested for the DaqBoard and a list of test results appears on screen.

Note: If you experience difficulties, please consult your user documentation (included on your CD) before calling for technical support. Note that the user documentation includes a troubleshooting chapter, as well as a great deal of information regarding specific DBK cards and modules, which can be used with DaqBoard/2000 systems.



Test Hardware Tab
(Condensed Screen Image)

At this point we are ready to connect signals.

- For DaqBoard/2000 Series boards, signal connection is typically accomplished with the use of a DBK200 Series option.
- For DaqBoard/1000 Series boards, connection is typically made via a terminal board, such as the optional TB-100.

Reference Notes:

- DaqBoard/2000 Series users: For detailed information regarding the DBK200 Series options, refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).
- During software installation, Adobe® PDF versions of user manuals are automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the Windows Desktop. A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of manuals can be ordered from the factory.

This guide tells you how to complete the following steps for a successful installation.

Step 1 – Install Software …… page 2
Step 2 – Install Boards into Available, 5 Volt, Compact-PCI Bus-Slots …… page 2
Step 3 – Configure Boards ….. page 4
Step 4 – Test Hardware ….. page 5

Reference Note:
After you have completed the installation you should refer to the electronic documents that were automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the Windows Desktop.

You should keep your DaqBoard/2000c Series board's serial number and your DaqView/2000 authorization code (if applicable) with this document. Space is provided below for recording up to 4 board numbers and their compact-PCI bus-slot location. Board serial numbers are located on the 100-pin P4 connector.

	Board Type e.g., DaqBoard/2005c	Serial Number	Compact-PCI Bus-Slot Location
Board 1			
Board 2			
Board 3			
Board 4			

Compact PC support for DaqBoard/2000c Series boards varies. A system can support no more than four boards.

***Note**: The DaqBoard/2000c Series boards have their board identity indicated on the latch, as indicated in the photo on the front page of this guide. This identification is provided since the boards look very much alike and are visually identical once installed.

DaqView/2000 Authorization Code _____

Customers who ordered DaqView/2000 can find their authorization code on the *authorization code sheet* located inside the sleeve of the install CD. Customers who did not order DaqView/2000 can run a *30-day free trial version*, as discussed in the user's manual.

CAUTION

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

Reference Note:
During software installation, Adobe® PDF versions of user manuals are automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the Windows Desktop. A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of manuals can be ordered from the factory.

Note: In regard to functionality, the DaqBoard/2000c Series boards are identical to their DaqBoard/2000 Series counterparts.

© 2001 through 2004 by Measurement Computing Corp

Reference Notes:

- Each DaqBoard/2000c Series Board plugs into a 5 volt, compact-PCI bus-slot located on the PC's backplane. Note that the 5 V compact-PCI bus-slot contains a blue key (see page 3). Consult your PC owner's manual as needed.
- Be sure to read about the DBK cards and modules applicable to your acquisition system. Specific DBK information can be found in on the world wide web at http://www.daqboard.com; and in your *DBK Option Cards and Modules User's Manual* (p/n 457-0905). After the install you can navigate to the DBK manual and other relevant electronic documents from your desktop as follows:
  Start ⇒ Programs ⇒ IOtech DaqX Software ⇒ DaqBoard 2000 Series Users

Reference Note: Adobe PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software. Note that hardcopy versions of the manuals can be ordered from the factory.

Minimum System Requirements

PC system with Pentium® Processor
Windows Operating System
RAM, as follows:
- 32 Mbytes of RAM for Windows 95/98/NT
- 64 Mbytes of RAM for Windows Me
- 64 Mbytes of RAM for Windows 2000
- 64 Mbytes of RAM for Windows XP

Step 1 – *Install Software*

IMPORTANT: Software must be installed before installing hardware.

1. Remove previous version Daq drivers, if present. You can do this through Microsoft's **Add/Remove Programs** feature.
2. Place the Data Acquisition CD into the CD-ROM drive. *Wait for PC to auto-run the CD. This may take a few moments, depending on your PC.* If the CD does not auto-run, use the Desktop's Start/Run/Browse feature.
3. After the intro-screen appears, follow the screen prompts.

Upon completing the software installation, continue with step 2, *Install Boards in available 5 Volt, Compact-PCI Bus-slots*.

Step 2 – *Install Boards in available 5 Volt, Compact-PCI Bus-slots*

IMPORTANT: Software must be installed before installing hardware.

IMPORTANT: Bus Mastering DMA *must be* Enabled.
For a DaqBoard/2000c Series board to operate properly, Bus Mastering DMA *must be enabled*. Prior to installation, verify that your computer is capable of performing Bus Mastering DMA for the applicable compact-PCI bus-slot. Note that some computers have BIOS settings that enable [or disable] Bus Mastering DMA. If your computer has this BIOS option, ensure that Bus Mastering DMA is *Enabled* on the appropriate compact-PCI bus-slot.

Refer to your PC's owner manual for additional information regarding Bus Mastering DMA.

IMPORTANT: The Compact-PCI Bus-Slot must be keyed for 5 Volt use.
Note: The 5 Volt Key location is indicated in the first photograph on page 3.

CAUTION

Turn power OFF, and UNPLUG the host PC and externally connected equipment prior to removing any cover plates or modules. Electric shock or damage to equipment can result even under low-voltage conditions.

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

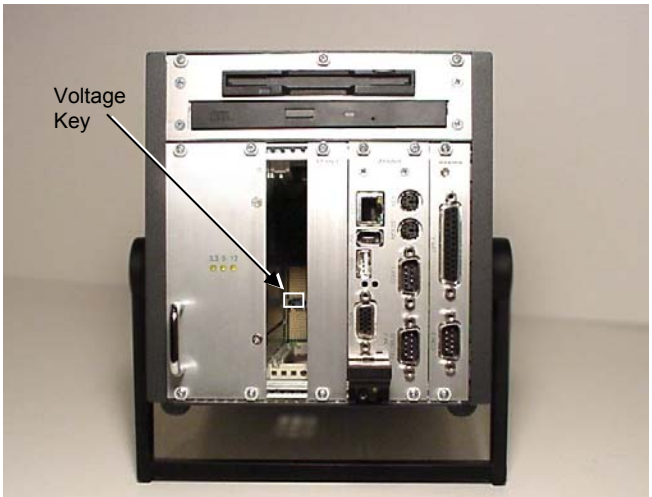
Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges or ORBs. Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

1. Turn the PC's power **OFF**.
2. Turn **power OFF** to externally connected equipment.
3. **UNPLUG the host PC** and all externally connected equipment.
4. Remove the computer's compact-PCI bus-slot cover plate [or remove an unwanted module, if applicable]. *Refer to your PC Owner's Manual as needed*.
5. Verify that the available compact-PCI bus slot is for 5 volt applications.

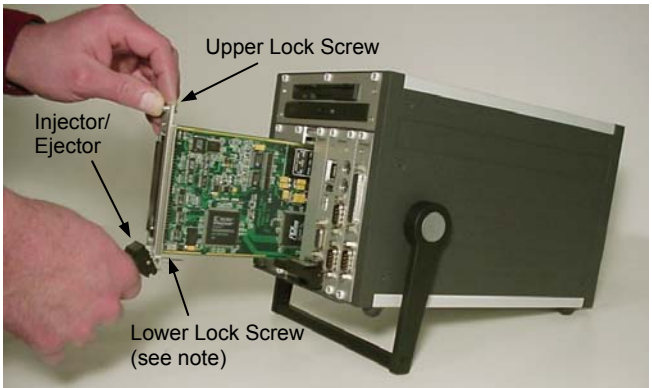
   The computer's 5 volt compact-PCI bus-slots can be recognized by a blue voltage key that is located in the center of the slot (see figure).

6. Carefully remove the DaqBoard/2000c Series Board from its anti-static protective bag. If you have not already done so, write down the serial number of your board at this time. The serial number is located on the 100-pin P4 connector.
7. With the board's *injector/ejector* down, guide the board into the PC's slot. Note that the top and bottom edges of the board locate in edge-guides, within the PC.
8. Push the board back into the PC to engage the board's compact-PCI connector with the computer's compact-PCI bus-slot.
9. Pull the board's *injector/ejector* up. This will fully engage the connectors.
10. Secure the board by tightening the upper and lower lock screws.
11. Using the previous steps, install additional boards into available compact-PCI bus-slots, if applicable to your application.

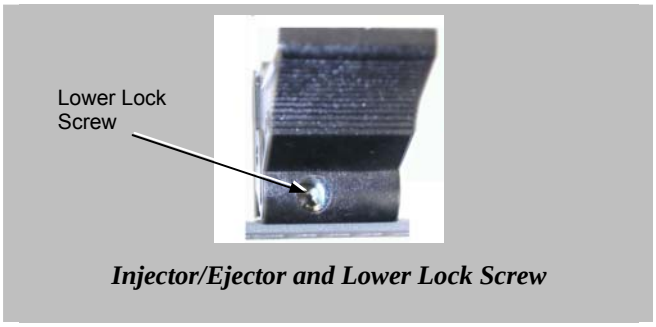
Note: The lower lock screw is accessed through an opening on the *injector/ejector* as indicated in the right-hand figure.



Compact-PCI Bus-Slot with Blue 5 Volt Identifier Key



Installing a DaqBoard/2000c Series Board



Injector/Ejector and Lower Lock Screw

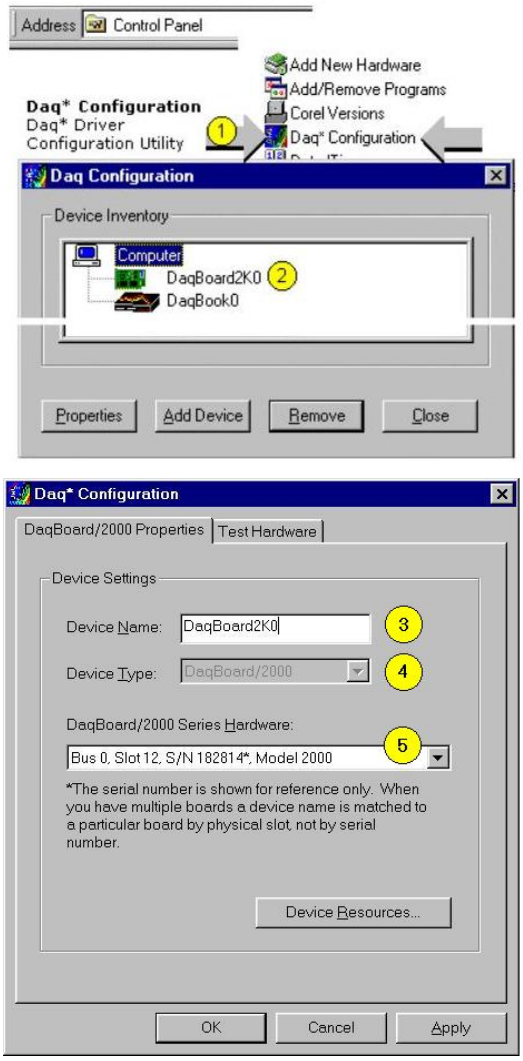
12. Plug in all cords and cables that were removed in step 3.
13. Apply power to, and start up the PC.

Note: At this point some PCs may prompt you to insert an installation disk. While this is rare, if you do receive such a prompt simply place the install CD into the disk drive and follow the screen prompts.

Securing a DaqBoard/2000c Series Board

Step 3 – *Configure Boards*

DaqBoard/2000c Series boards have no jumpers or switches to set. Configuration is performed entirely through software. Refer to the following figure and steps to complete the configuration. The numbers in the figure correspond to the numbered steps immediately following the figure.



Accessing the DaqBoard/2000 Properties Tab

1. Run the **Daq Configuration** control panel applet. Navigation from the desktop to the applet is as follows:
   Start ⇒ Settings ⇒ Control Panel ⇒ Daq*Configuration *(double-click)*
2. Double-click on the Device Inventory's DaqBoard2K0 icon. The DaqBoard/2000 Properties tab (used for the entire DaqBoard/2000 Series) will appear. **If the DaqBoard2K0 icon is not present, skip to the *Using 'Add Device'* section provided below.**
3. Enter a "**Device Name**" in the text box, or use the default "DaqBoard2K0." Device Name is for identifying the specific DaqBoard/2000 Series board. Note that Device Name actually refers to the PCI slot and not to the actual board.
4. Verify that the "Device Type" shows the correct DaqBoard/2000 Series board, e.g., "DaqBoard/2000, DaqBoard/2001, etc." Note that available device types can be viewed via the pull-down list ( ).
5. Confirm that the DaqBoard/2000 Series text box shows a **Bus #, Slot #,** and **Serial Number**.
   If this text box is empty, use its pull-down list ( ) and select the serial number that matches the one for your board. Refer to the inside front cover page for serial number information.

Using "Add Device"

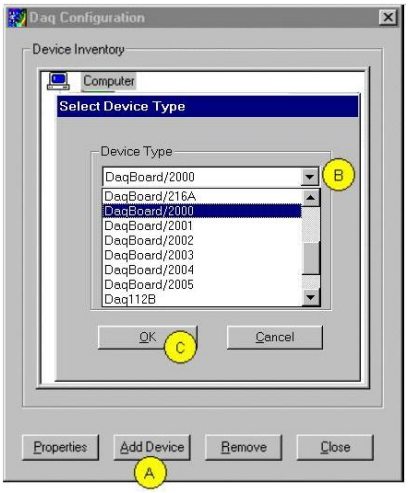
This method is for users who have accessed the **Daq Configuration** control panel applet, but have no DaqBoard2K icon (as described in step 2, above).

(A) After accessing the Daq Configuration control panel applet, click on the Add Device button (see figure, right). The *Select Device Type* window will appear.

(B) Using the *Device Type's* pull-down list, select the applicable board. In the example at the right **DaqBoard/2000** is selected.

(C) Click the **OK** button. The DaqBoard/2000 Properties tab will appear. This tab applies to all boards in the DaqBoard/2000 Series.

At this point, complete steps 3 through 5 from above.



Using "Add Device"

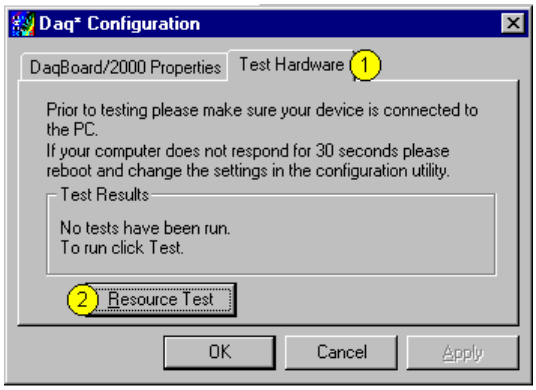
Step 4 – *Test Hardware*

Use the following steps to test the DaqBoard/2000 Series board. Note that these steps are continued from those listed under the previous section, "Configure Board."

1. Select the "**Test Hardware"** tab.
2. Click the "**Resource Test**" button.
3. After the test is complete, click "**OK**."

System capability is now tested for the DaqBoard/2000 Series board and a list of test results appears on screen.

Note: If you experience difficulties, please consult your user documentation (included on your CD) before calling for technical support. Note that the user documentation includes a troubleshooting chapter, as well as a great deal of information regarding specific DBK cards and modules.



Test Hardware Tab (Condensed Screen Image)

At this point we are ready to connect signals. This is typically accomplished with the use of a DBK200 Series option.

Reference Note:
For detailed information regarding the DBK200 Series options, refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).

During software installation, Adobe® PDF versions of user manuals are automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the Windows Desktop. A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of manuals can be ordered from the factory.

Notes

Daq Systems and Device Overviews 1

Daq Systems, the Modular Concept …… 1-1
Theory of Operation, DaqBoard/1000 and /2000 Series Boards …… 1-3
DaqBoard/1000 …… 1-7
DaqBoard/1005 …… 1-9
DaqBoard/2000 ……. 1-11
DaqBoard/2001……. 1-13
DaqBoard/2002…… 1-15
DaqBoard/2003…… 1-17
DaqBoard/2004…… 1-19
DaqBoard/2005…… 1-21
Using DBK Cards and Modules for Signal Conditioning ….. 1-23
Daq Software ……1-23

Daq Systems, the Modular Concept

Daq equipment and software form a modular, interrelated family of products that provide great flexibility in data acquisition system design. This flexibility allows for the development of custom systems that are unique to the user, and which can be optimized for his or her specific application needs. With the Daq product line, system expansion or redesign can typically be accomplished with relative ease.

- ***Primary Acquisition Device***. This is the main data acquisition device, e.g., a DaqBook, DaqBoard, or Daq PC-Card. These devices provide a vital data conversion and communications link between the data source of transducers and signal conditioners and the data processor of the host computer. Note that a DaqBoard can be one of three types: (1) ISA, (2) PCI, or (3) compact-PCI.

- ***DBK Option Cards and Modules***. Over 35 DBK cards and modules (the number is constantly growing) provide various types of signal conditioning and system expansion. Note that certain DBK modules exist for the purpose of supplying power to other members of the acquisition system. The DBK options are discussed in a *DBK Basics* document module and in the detailed *DBK Option Cards and User's Manual* (p/n 457-0905). **DaqBoard/1000 Series boards do not support DBK options**.

  Note: Only *passive* DBKs, such as the DBK1 BNC module, the DBK11A screw terminal card, and the DBK40 BNC analog interface, can be used with a Daq PC-Cards.

  Reference Note:
  DBK options are discussed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop.

- ***Software***. DaqView *out-of-the-box* software provides a graphical user interface with easy to read spreadsheet formats for viewing channel data, as well as a choice of analog, digital, and bar-graph meters. Waveform analysis can be performed, when applicable. A product support option, included on the data acquisition CD, provides a means of performing post data analysis. More information is included in the software-specific PDF documents that are installed on your hard-drive as a part of product support.

  In addition to the included out-of-the-box software, Daq products can be controlled via user-written custom programs through Applications Program Interface (API). Several languages are supported, including C/C++ and VisualBASIC.

DaqView and DASYLab can only be used with one DaqBoard at a time. LabView can be used with multiple boards. For multiple board use (via custom programming) refer to the *Using Multiple Devices* section of the *Programmer's Manual*.

Reference Note:
Programming topics are covered in the *Programmer's User Manual* (p/n 1008-0901). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs group, which can be accessed through the Windows Desktop.

Daq Data Acquisition Devices		
Category	**Device**	**Description**
Primary Acquisition Device	DaqBook	**Portable Data Acquisition Modules** 12-bit: DaqBook/100, /112, /120 16-bit: DaqBook/200, /216, /260, /2001, /2005, /2020
	DaqBoard/1000 Series*	**Plug-In Boards for PCI Bus-Slots** 16-bit , 200 kHz. 2 boards identified as /1000 and /1005 Make use of a 68-pin SCSI III connector. The DaqBoard/1000 Series boards do not support DBK options.
	DaqBoard/2000 Series	**Plug-In Boards for PCI Bus-Slots** 16-bit , 200 kHz. Six boards identified as /2000 through /2005. Make use of a 100-pin connector (P4).
	DaqBoard/2000c Series	**Plug-In Boards for Compact-PCI Bus-Slots** 16-bit , 200 kHz. Six boards identified as /2000c through /2005c. Make use of a 100-pin connector (P4). Unless otherwise specified, documentation discussing a DaqBoard/2000 series board also applies to a DaqBoard/2000c Series board.
	DaqBoard (ISA types)	**Plug-In Boards for ISA Bus-Slots** 12-bit: DaqBoard/100A, /112A 16-bit: DaqBoard/200A, /216A, /2000
	Daq PC-Card	**Plug-In PCMCI Card** 12-bit: Daq/112B 16-bit: Daq/216B
DBK Option Cards and Modules*	Analog Signal Conditioning	**Cards and modules used to condition Analog Signals** DBK/ 4, 7, 8, 9, 12, 13, 15, 17, 18, 19, 42, 43A, 44, 45, 50, 51, 52, 53, 54, 55, 65, 80, 81, 82, 83, 84, 85, 90, 100, 207, 207/CJC
	Analog Output	**Cards used to modify Analog Output Signals** DBK/ 2, 5
	Digital I/O and Control	**Cards and modules used to condition Digital I/O** DBK/ 20, 21, 23, 24, 25, 208, 210
	Expansion Connections	**Cards and modules used to expand the acquisition system.** DBK/ 1, 10, 11A, 35, 40, 41, 60, 200, 201, 202, 203, 204, 205, 206, 209
	Power Supply	DBKs: 30A, 32A, 33, 34
Software	Included Software	DaqView, Post Data Acquisition Analysis Program (actual application not specified), Visual Basic extensions, Application Programming Interface (API)
	Optional Software	DaqView/2000, DaqViewXL, DASYLab

*** DBK Option cards and modules are not supported by DaqBoard/1000 Series boards.**

As implied by the following matrix, the operational material does not apply globally to every board. For example, DaqBoard/1005, /2002, and /2005 have no analog output channels.

For ease of understanding, each board is discussed independently, following the matrix. Note that pinouts are provided in chapter 2 for the DaqBoard/1000 Series and in chapter 3 for the DaqBoard/2000 Series.

I/O Comparison Matrix

I/O Comparison Matrix for DaqBoard/1000 and /2000 Series Boards

DaqBoard Identity	Analog Input Channels	Analog Output Channels	Digital I/O Channels	Counter Inputs	Timer Outputs
1000	16	2	24	4	2
1005	16	--	24	4	2
2000	16	2	40	4	2
2001	16	4	40	4	2
2002	--	--	40	4	2
2003	--	4	--	--	--
2004	--	4	40	4	2
2005	16	--	40	4	2

Note: DaqBoard/1000 Series boards do not support DBK options.

Synchronous Input Operations for DaqBoard/1000 and DaqBoard/2000 Series Boards

As indicated in the I/O matrix, applicable DaqBoards allow for synchronous scanning and acquisition of Analog Input, Digital Input and Counter Input Data at up to 200kHz aggregate scanning rates.

For applicable DaqBoard/2000 Series devices, the Analog Input data can be either directly to the board or from expansion analog input modules connected to P1. The Digital Input data can be to the board's 8-bit P2 (8255) digital inputs, 16-bit P3 digital inputs or P2 compatible DBK digital input expansion modules. Refer to the applicable pinouts to see how P1, P2, and P3 relate to the 100-pin P4 connector.

DaqBoard/1000 Series boards do not support DBK options.

Analog Input Channels

The boards that offer analog input (see previous matrix) allow analog input configuration for the board.

For applicable DaqBook/2000 Series boards, analog input can be received from P1 compatible DBK analog input expansion modules.

Channel Selection and Mode Settings

The main unit accepts up to 16 single ended or up to 8 differential-ended inputs and can be programmed for single-ended or differential-ended on a per channel basis. In regard to DaqBoard/2000 Series boards, just one analog channel is sacrificed when a DBK expansion module is enabled. See DBK documentation in the *DBK Option Cards & Modules User's Manual* (p/n 457-0905) for further information.

Channel Range and Polarity

DaqBoard/2000 Series board channels can be programmed for either unipolar or bipolar mode with gain settings of 1,2,4,8,16,32 and 64. DaqBoard/1000 Series boards have the same gains but are only bipolar.

Channel Sampling Interval

The boards allow programmable sampling intervals of 5us or 10us on a per channel basis. This mode allows some channels which change slowly but a higher degree of accuracy is desirable to be sampled at a longer interval while channels that change more rapidly to be sampled using a shorter interval. Each 5us or 10us interval reduces the maximum aggregate acquisition rate for the entire scan by that amount.

Digital Input Channels

Associated boards allow either synchronous scanning of digital input channels or asynchronous I/O operations for all configured digital channels.

Counter Input Channels

Associated boards allow synchronous scanning of the 4 16-bit counter input channels. The four 16-bit counter channels can also be cascaded into two 32-bit counter channels. For either cascaded or non-cascaded counter channels each channel can be configured for:

- ***Pulse Counting Mode*** – specifies that each counter should be cleared upon being read and placed into the input scan.
- ***Totalize Counting Mode*** – specifies that each counter is to free-run and not be cleared during the input acquisition.

Synchronous Input Acquisition Clocking

Associated boards allow clocking of the synchronized inputs either by an internal, programmable pacer clock or by external clocking. These products use a sequencer to implement a multiplexing approach to gathering the input data. This means that with either internal or external clocking the entire channel scan (including the sampling time for each channel) may not exceed the maximum aggregate rate of 200kHz.

Synchronous Output Operations

The DaqBoard/1000 allows synchronous output of any D/A channels available at up to 100kHz for each channel. All D/A channels available may have output streamed to them and clocked out synchronously. The D/A channels may be configured for waveform output.

The DaqBoard/2000 Series boards allow synchronous output of any D/A or P3 16-bit Digital channels available at up to 100kHz for each channel. All D/A channels available and the 16-bit P3 Digital channel may have output streamed to them and clocked out synchronously. The D/A channels may be configured for waveform output and the P3 digital channel may be configured for streamed digital pattern output using the same clock sources.

Output Channel Configuration

Analog Output Channels

Each D/A channel can be configured for waveform output individually. If the D/A channel is not configured for waveform output it then is available for asynchronous output operations.

Digital Pattern Output Channel (DaqBoard/2000 Series Only)

In regard to DaqBook/2000 Series boards, the 16-bit P3 Digital Port can be configured for streamed digital pattern output. If not configured for streamed digital pattern output operations it then may be used for asynchronous digital I/O operations.

Synchronous Output Clocking

Associated boards allow clocking of the synchronized output by the acquisition clock source, an internal, programmable pacer clock or by an external clock source. When the clock source generates a new clock signal all outputs are updated concurrently. Regardless of the clock source, the clock may not exceed the maximum update rate of 100kHz.

Synchronous Output Data Source

Associated boards allow the data source for synchronized output operations to be that of a memory based buffer or a file located on a mass storage medium. With either type of output data source, the output data for all the channels are contained in the buffer and/or file. The file path may be any file located on the machine or network accessible file.

Asynchronous I/O Operations

Associated boards allow asynchronous input of any counter or digital channel that is not currently configured for synchronous acquisition. The boards also allow for asynchronous output to any D/A channels not currently configured for waveform output.

In addition, for DaqBoard/2000 Series boards, the 16-bit P3 digital port can be used for both asynchronous input and output operations if it is not currently configured for streamed pattern output operations. Also, the timer outputs can be programmed at any time regardless of the current state of synchronous or asynchronous operations on other channels.

Digital I/O Channels

Local 8255 Channels

The boards [which have digital I/O capabilities] have an implemented Intel 8255 core in the digital I/O logic. For DaqBoard/2000 Series boards, this is applicable to the P2 port [see pinouts for P2 to P4 relationship]. With the Intel 8255 there are three 8-bit wide ports available for I/O and one 8-bit wide port for configuration purposes. The configuration port is used to configure the other three 8-bit ports for either input or output operations.

Local 16-bit P3 Port (DaqBoard/2000 Series only)

For DaqBoard/2000 series devices, the 16-bit P3 Digital Port can be used as either an input, or an output port. With this port, no configuration is required as the port simply outputs when written to and inputs when read.

Expansion Digital I/O (DaqBoard/2000 Series only)

The DaqBoard/2000 Series boards that have digital I/O capabilities have the ability to expand these through the P2 port and the connection of applicable digital I/O expansion modules. These modules are discussed in the *DBK Option Cards & Modules User's Manual*. When using the digital I/O expansion modules the local P2 Intel 8255 digital I/O becomes inaccessible in lieu of the expansion modules. These expansion modules provide additionally Intel 8255 ports as well as input isolation for applications that require the expanded capabilities.

Pulse Stream Output Using Timers

The boards allow the generation of output pulses based upon a programmable setting. These output timers can be set at any time regardless of the state of any synchronous or asynchronous operations which are currently taking place on other channels.

Analog Output Channels

The boards that have analog output capabilities have the ability to output analog data to any of the available (up to four) D/A channels. Each D/A channel may be asynchronously updated by an application if the D/A channel is not currently being used for waveform output operations.

Counter Input Channels

With exception of DaqBoard/2003, the boards have counter input capabilities and have the ability to read counter input [if the counter channel is not configured for synchronous acquisition]. As in the case of synchronous operations the 4 16-bit counter input channels can be used individually or cascaded into two 32-bit counter channels. For either cascaded or non-cascaded counter channels each channel can be configured for:

- ***Clear on Read Mode*** - specifies that each counter should be cleared (reset to 0) upon being read.
- ***Continuous Totalize Mode*** – specifies that each counter is to *free-run* and not be cleared during the read operation.

Operation Matrix*

Operation	1000	1005	2000	2001	2002	2003	2004	2005
Synchronous Input								
Analog Main Unit Inputs	Yes	Yes	Yes	Yes	No	No	No	Yes
Analog Expansion Input	No	No	Yes	Yes	No	No	No	Yes
Counter Inputs	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Digital Main Unit Inputs	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Digital Expansion Inputs	No	No	Yes	Yes	Yes	No	Yes	Yes
Synchronous Output								
Analog D/A Waveform Output	Yes	No	Yes	Yes	No	Yes	Yes	No
Streamed Digital Output (16-bit)	No	No	Yes	Yes	Yes	No	Yes	Yes
Asynchronous IO								
Main Unit Digital I/O	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Expansion Digital I/O	No	No	Yes	Yes	Yes	No	Yes	Yes
Timer Output (Pulse Generation)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Analog Output	Yes	No	Yes	Yes	No	Yes	Yes	No

* A similar matrix, intended to highlight board differences at a glance, is presented on page 1-3.

DaqBoard/1000

16 Analog Input | **2 Analog Output** | **24 Digital I/O** | **4 Counter Inputs** | **2 Timer Outputs**

DaqBoard/1000 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, two 16-bit, 100-kHz D/A converters, 24 digital I/O lines, four counters, and two timers.

Up to four boards can be installed into a PC.

One 68-pin SCSI III connector on the board provides access to all of the input and output signals. The DaqBoard/1000 accommodates all I/O with one cable and one PCI slot.
The 68-pin I/O connector is logically divided into three functions:

- Analog input for16 single-ended or 8 differential analog inputs with 7 software programmable bipolar ranges (±10 V to ±156 mV full scale).
- 24 lines of general purpose digital I/O.
- 4 counter inputs, 2 timer outputs, and 2 analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5μs or 10 μs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard without consuming CPU time.

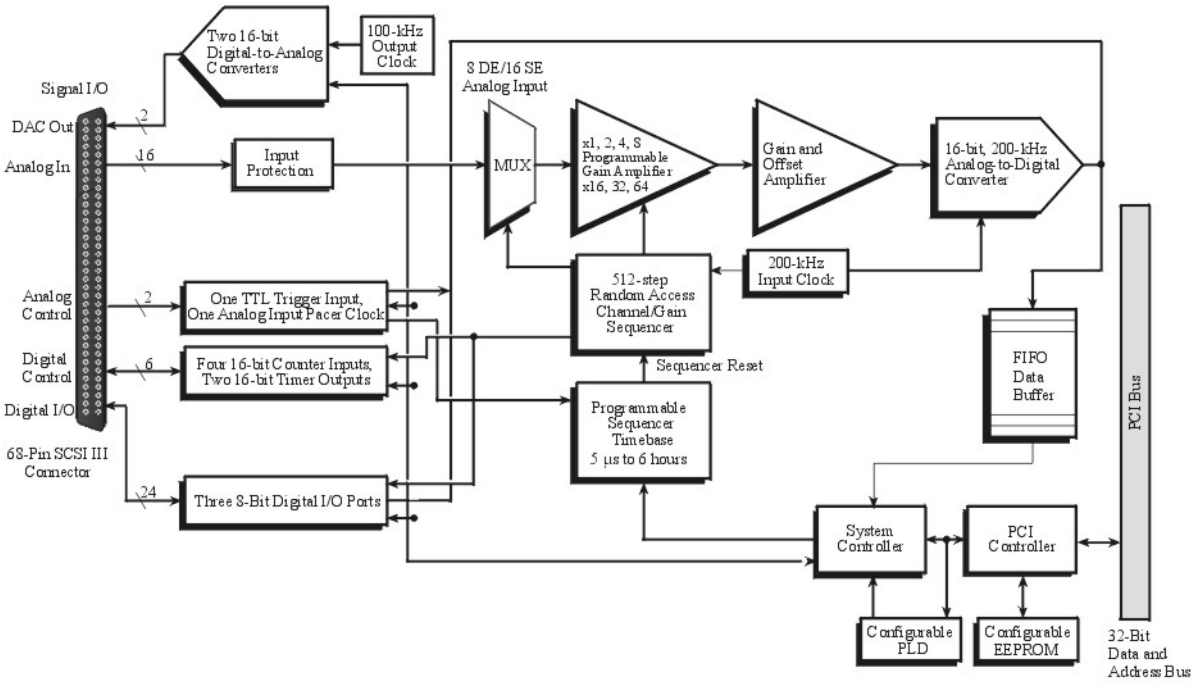
DaqBoard/1000 supports trigger modes that include:

- **Digital and pattern triggering** – The boards have separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 μs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from analog, digital, or counter readings. Six pre- and post-triggering modes are supported.

The two 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. Using Bus Mastering DMA, each D/A can output a waveform.

Other features of the DaqBoard/1000 include:

- **24 TTL-level digital I/O lines**. They are divided into three 8-bit ports.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/1000.



DaqBoard/1000 Block Diagram

Connections

Installation

Reference Note:
For the DaqBoard/1000 installation procedure, refer to the *DaqBoard/1000 and /2000 Series Installation Guide*. A copy of the guide is included at the beginning of this manual.

I/O Connectors

All input and output signals are available at the board's 68-pin SCSI III connector. Chapter 2 includes a pinout. The following cable and terminal board options can be used to provide convenient screw terminal connections for all signal I/O lines.

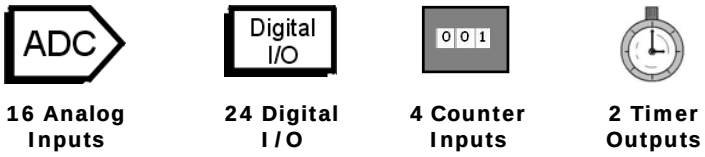
Mating Cable: The CA-G56 is a 68-conductor shielded cable. It is used to connect a DaqBoard/1000 Series board to a TB-100 termination board. The cable length is 3 feet.

TB-100: TB-100 is an optional termination board. It provides convenient screw terminal connections for all signal I/O lines of a DaqBoard/1000 Series board.

Reference Note:

The TB-100 terminal board connection option is discussed in chapter 2.

DaqBoard/1005



DaqBoard/1005 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, 24 digital I/O lines, four counters, and two timers.

Up to four boards can be installed into a PC.

One 68-pin SCSI III connector on the board provides access to all of the input and output signals. The DaqBoard/1000 accommodates all I/O with one cable and one PCI slot. The 68-pin I/O connector is logically divided into three functions:

- Analog input for16 single-ended or 8 differential analog inputs with 7 software programmable bipolar ranges (±10 V to ±156 mV full scale).
- 24 lines of general purpose digital I/O.
- 4 counter inputs and 2 timer outputs

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5μs/channel or 10 μs/channel.

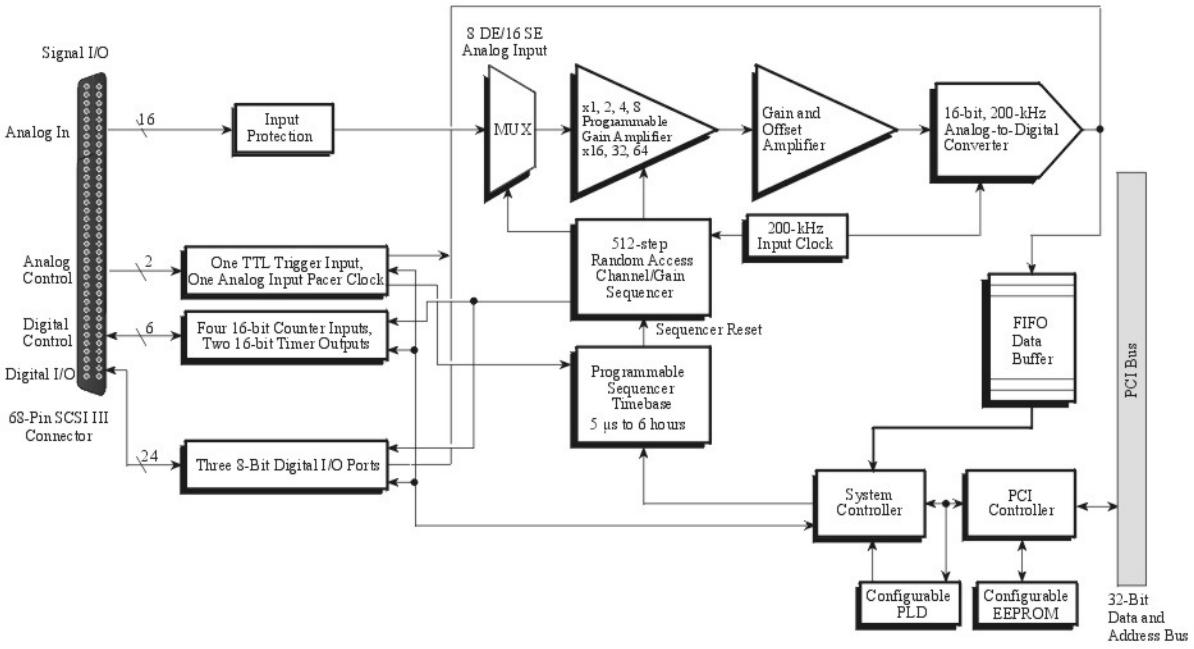
Bus mastering allows analog and digital/counter input data, as well as digital output data, to flow between the PC and the DaqBoard without consuming CPU time.

DaqBoard/1005 supports trigger modes that include:

- **Digital and pattern triggering** – The boards have separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 μs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from analog, digital, or counter readings. Six pre- and post-triggering modes are supported.

Other features of the DaqBoard/1000 include:

- **24 TTL-level digital I/O lines**. They are divided into three 8-bit ports.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/1005.



DaqBoard/1005 Block Diagram

Connections

Installation

Reference Note:
For the DaqBoard/1005 installation procedure, refer to the *DaqBoard/1000 and /2000 Series Installation Guide*. A copy of the guide is included at the beginning of this manual.

I/O Connectors

All input and output signals are available at the board's 68-pin SCSI III connector. Chapter 2 includes a pinout. The following cable and terminal board options can be used to provide convenient screw terminal connections for all signal I/O lines.

Mating Cable: The CA-G56 is a 68-conductor shielded cable. It is used to connect a DaqBoard/1000 Series board to a TB-100 termination board. The cable length is 3 feet.

TB-100: TB-100 is an optional termination board. It provides convenient screw terminal connections for all signal I/O lines of a DaqBoard/1000 Series board.

Reference Note:

The TB-100 terminal board connection option is discussed in chapter 2.

DaqBoard/2000

16 Analog Input

2 Analog Output

40 Digital I/O

4 Counter Inputs

2 Timer Outputs

DaqBoard/2000 and DaqBoard/2000c are high-speed, multi-function, plug-and-play data acquisition boards for PCI and compact-PCI bus computers, respectively. They feature a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, two 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2000. Up to four boards can be installed into a PC.

A 100-pin connector on the boards provides access to all of the input and output signals. The DaqBoard/2000 and /2000c accommodate all I/O with one cable and one PCI [or compact-PCI] slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5μs or 10 μs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard/2000 without consuming CPU time.

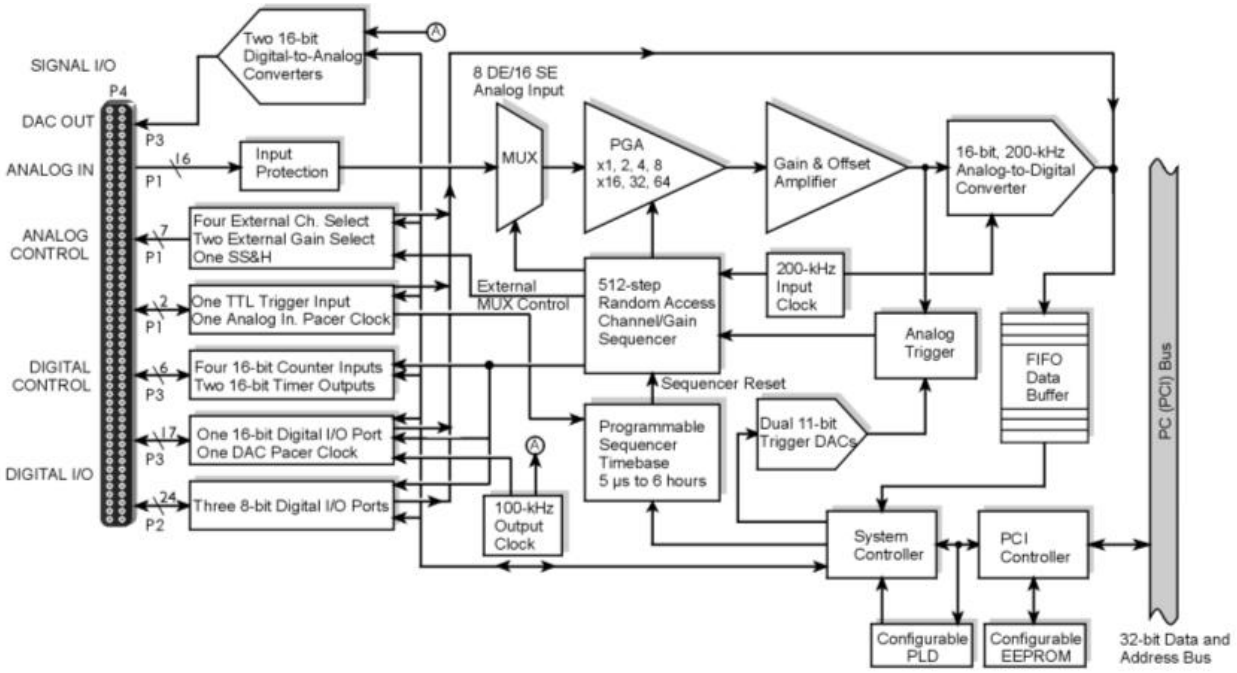
DaqBoard/2000 supports a full complement of trigger modes including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 μs.
- **Digital and pattern triggering** – The boards have separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 μs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The two 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. (These channels are separate from the D/As used to determine analog trigger levels.) Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2000 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2000.



DaqBoard/2000 Block Diagram*

* The DaqBoard/2000c Block Diagram is the same, with exception that the /2000c board uses a compact-PCI Bus instead of a standard PCI bus.

Connections

Installation

Reference Note: For the DaqBoard/2000 and DaqBoard/2000c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connectors

All input and output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

Reference Note: There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). In addition to being briefly discussed in chapter 3 of this manual, these options, referred to as DBK200 Series, are detailed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

DaqBoard/2001

16 Analog Input

4 Analog Output

40 Digital I/O

4 Counter Inputs

2 Timer Outputs

DaqBoard/2001 and DaqBoard/2001c are high-speed, multi-function, plug-and-play data acquisition boards for PCI or compact-PCI bus computers, respectively. They feature a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, four 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2001 board. Up to four boards can be installed into a PC.

A 100-pin connector on the DaqBoard/2001 provides access to all of the input and output signals. The boards accommodate all I/O with one cable and one PCI [or compact-PCI] slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5µs/channel or 10µs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard/2001 without consuming CPU time.

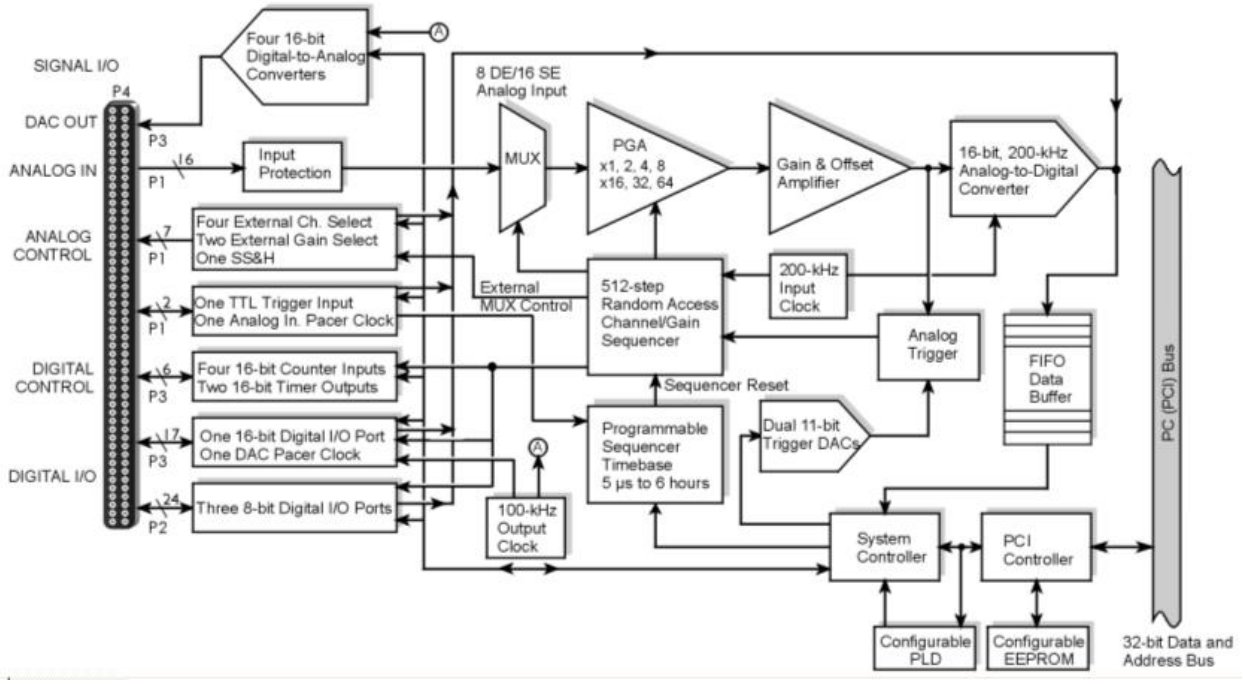
DaqBoard/2001 supports a full complement of trigger modes including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 µs.
- **Digital and pattern triggering** – The DaqBoard/2001 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The four 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. (These channels are separate from the D/As used to determine analog trigger levels.) Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2001 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on a DaqBoard/2001.



DaqBoard/2001 Block Diagram*

* The DaqBoard/2001c Block Diagram is the same, with exception that the /2001c board uses a compact-PCI Bus instead of a standard PCI bus.

Connections

Installation

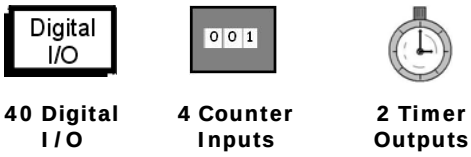
Reference Note: For the DaqBoard/2001 and /2001c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connector

All input and output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

Reference Note: There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). In addition to being briefly discussed in chapter 3 of this manual, these options, referred to as DBK200 Series, are detailed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

DaqBoard/2002



DaqBoard/2002 and /2002c are high-speed, multi-function, plug-and-play data acquisition boards for PCI and compact-PCI bus computers, respectively. They feature digital calibration, bus mastering DMA, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one board. Up to four boards can be installed into a PC.

A 100-pin connector on the boards provides access to all of the input and output signals. The boards accommodate all I/O with one cable and one PCI [or compact-PCI] slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Not used by DaqBoard/2002
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 µs/channel or 10 µs/channel.

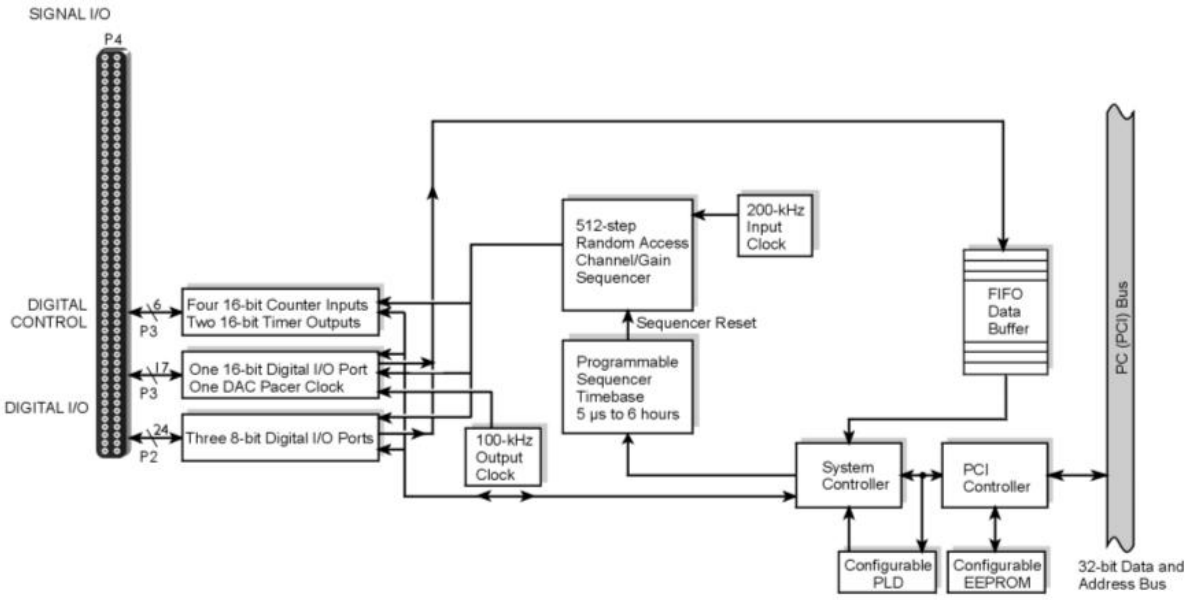
Bus mastering allows digital/counter input data and digital output data to flow between the PC and the DaqBoard/2002 board without consuming CPU time.

DaqBoard/2002 supports a complement of trigger modes including:

- **Digital and pattern triggering** – The boards have separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings [digital, or counter]. Six pre- and post-triggering modes are supported.

Other features of the DaqBoard/2002 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on a DaqBoard/2002.



DaqBoard/2002 Block Diagram*

*The DaqBoard/2002c Block Diagram is the same, with exception that the /2002c board uses a compact-PCI Bus instead of a standard PCI bus.

Connections

Installation

Reference Note: For the DaqBoard/2002 and compact-PCI DaqBoard/2002c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connector

All input and output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

Reference Note: There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). In addition to being briefly discussed in chapter 3 of this manual, these options, referred to as DBK200 Series, are detailed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

DaqBoard/2003

4 Analog Outputs

DaqBoard/2003 and /2003c are high-speed plug-and-play data acquisition boards for PCI and compact-PCI bus computers, respectively. The boards are used for analog output and include four 16-bit, 100-kHz D/A converters. Up to four boards can be installed into a PC.

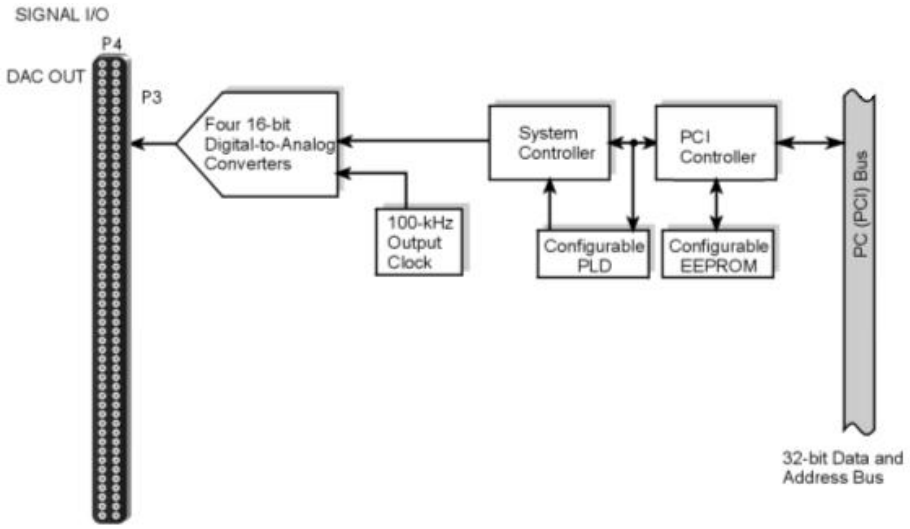
A 100-pin connector on the boards provides access to the DAC analog output signals. The boards plug directly into a PCI or compact-PCI bus slot, as applicable. The DAC analog output leaves the board through "P3-designated" pins located on the board's 100-pin P4 connector.

Both boards support **Software-based triggering**. In "Software-based" triggering the PC detects the trigger event from the readings. Six pre- and post-triggering modes are supported.

DBK205 Terminations

TB1-1	AGND
TB1-2	DAC0
TB1-3	AGND
TB1-4	DAC1
TB1-5	AGND
TB1-6	DAC2
TB1-7	AGND
TB1-8	DAC3
TB1-9	AGND
TB1-10	XTTL
TB1-11	CLK
TB1-12	DGND

DBK205 Adapter



DaqBoard/2003 Block Diagram

Note: DaqBoard/2003 and DaqBoard/2003c are shipped with one DBK205 adapter. The adapter has twelve screw terminals as follows: DAC0, DAC1, DAC2, DAC3, 1 digital ground, 5 analog grounds, 1 external clock (CLK), and 1 external trigger (XTTL). DBK205 connects directly to DaqBoard/2003's P4 connector.

Connections

Installation

Reference Note: For the DaqBoard/2003 and DaqBoard/2003c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connector

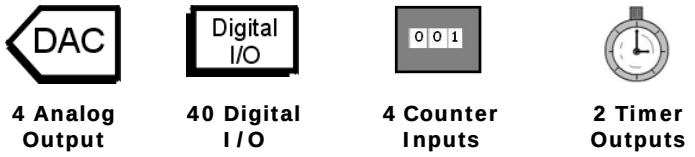
Analog output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4; however, a DBK205 adapter board is included for connecting the 100 pins of P4 to a terminal block (TB1).

DBK205's TB1 includes screw terminals for: DAC0, DAC1, DAC2, and DAC3, 1 digital ground, 5 analog grounds, 1 external clock (CLK), and 1 external trigger (XTTL). DBK205 connects directly to DaqBoard/2003's P4 connector or to a compact-PCI DaqBoard/2003c's P4 connector.

DBK205 is depicted as part of the block diagram above and is discussed briefly in chapter 3 of this manual. DBK205 is also discussed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

Notes

DaqBoard/2004



DaqBoard/2004 and /2004c are high-speed, multi-function, plug-and-play data acquisition boards for PCI and compact-PCI bus computers, respectively. They feature bus mastering DMA, four 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to four boards can be installed in one PC.

A 100-pin connector on the boards provides access to all of the input and output signals. Each board accommodates all I/O with one cable and one PCI [or compact-PCI] slot, as applicable. The 100-pin I/O connector, P4, is logically divided into three ports: P1, P2, and P3; however, DaqBoard/2004 only makes use of the P2 and P3 pin designations.

- **P1 –** Not used by DaqBoard/2004
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 μs or 10 μs per channel.

Bus mastering allows the digital/counter input data and analog and digital output data to flow between the PC and the DaqBoard/2004 without consuming CPU time.

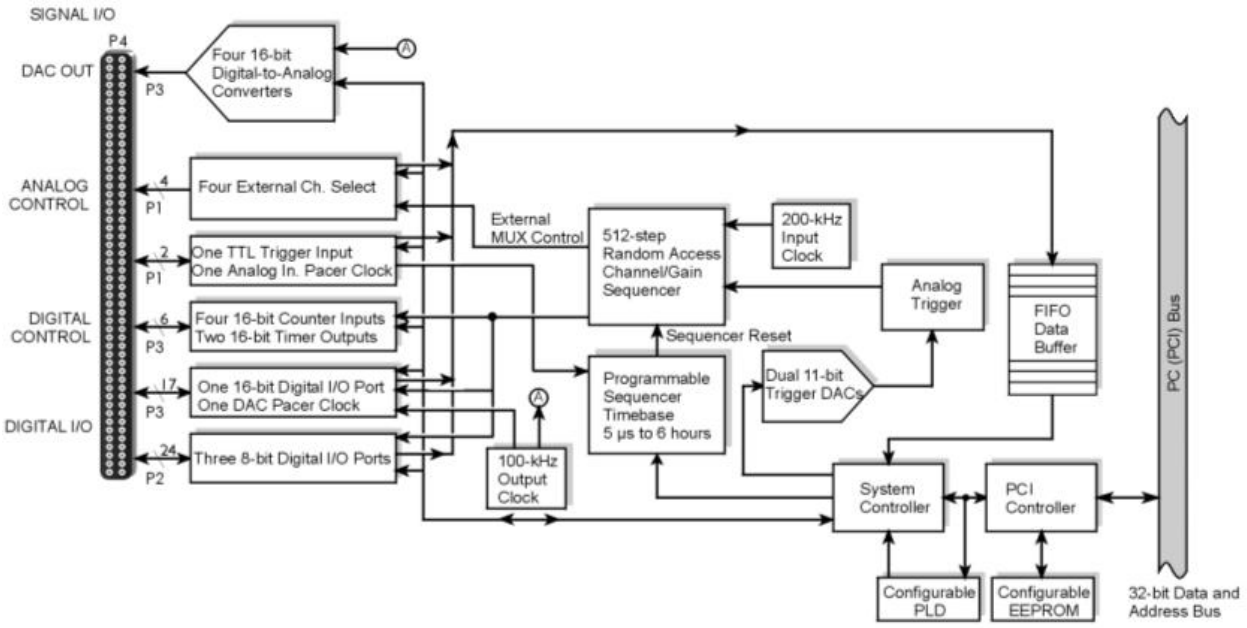
DaqBoard/2004 supports several trigger modes, including:

- **Digital and pattern triggering** – Each board has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 μs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The four 16-bit, 100-kHz analog output channels have an output from -10 V to +10 V. Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2004 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on a DaqBoard/2004.



DaqBoard/2004 Block Diagram*

* The DaqBoard/2004c Block Diagram is the same, with exception that the /2004c board uses a compact-PCI Bus instead of a standard PCI bus.

Connections

Installation

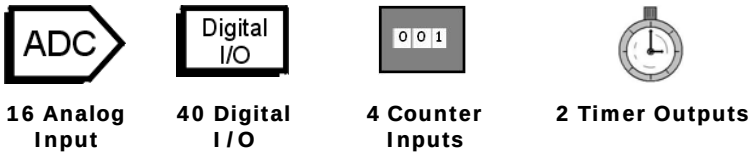
Reference Note: For the DaqBoard/2004 and DaqBoard/2004c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connector

All input and output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

Reference Note: There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). In addition to being briefly discussed in chapter 3 of this manual, these options, referred to as DBK200 Series, are detailed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

DaqBoard/2005



DaqBoard/2005 and DaqBoard/2005c are high-speed, multi-function, plug-and-play data acquisition boards for PCI and compact-PCI bus computers, respectively. They feature a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one board. Up to four boards can be installed in one PC.

A 100-pin connector on the board provides access to all of the input and output signals. The Each board accommodates all I/O with one cable and one PCI [or compact-PCI] bus-slot, as applicable. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for 16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, and timer outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 µs/channel or 10 µs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the board without consuming CPU time.

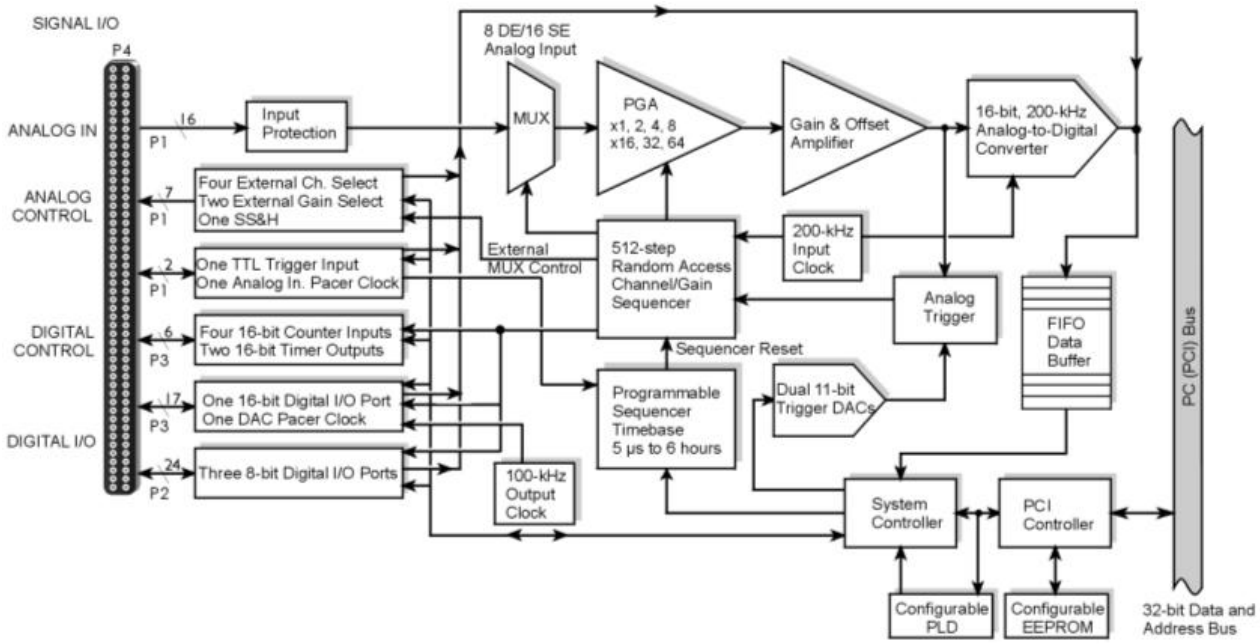
DaqBoard/2005 supports a full complement of trigger modes, including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 µs.
- **Digital and pattern triggering** – Both boards have a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2005 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on a DaqBoard/2005.



DaqBoard/2005 Block Diagram*

*The DaqBoard/2005c Block Diagram is the same, with exception that the /2005c board uses a compact-PCI Bus instead of a standard PCI bus.

Connections

Installation

Reference Note:
For the DaqBoard/2005 and compact-PCI DaqBoard/2005c installation procedure, refer to either the *DaqBoard/1000 and /2000 Series Installation Guide* or to the *DaqBoard/2000c Series Installation Guide*, as applicable. The guides are included at the beginning of this manual.

I/O Connector

All input and output signals are available at the board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

Reference Note:
There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). In addition to being briefly discussed in chapter 3 of this manual, these options, referred to as DBK200 Series, are detailed in the *DBK Cards and Modules User's Manual* (p/n 457-0905).

Using DBK Cards and Modules for Signal Conditioning

The DBK signal-conditioning cards and module are designed for use with DaqBooks, LogBooks, and various types of data acquisition boards, i.e., ISA, PCI, and compact-PCI types. The DBKs perform best when used with an acquisition device that can dynamically select channel, gain, and range. DBK cards and modules with dynamic channel and gain/range selection allow for high channel-to-channel scan rates with a variety of transducers.

Note: Only *passive* DBKs, such as the DBK1 BNC module, the DBK11A screw terminal card, and the DBK40 BNC analog interface, can be used with Daq PC-Cards.

DBK output signals can be bipolar, e.g., -5 to +5 V, or unipolar, e.g., 0 to 10 V. The user can select a range of relevant values to correspond to the lowest signal (e.g., -5 or 0 V) and the highest signal (e.g., 5 or 10 V) signal. This type of range selection guarantees the highest resolution in 12-bit or 16-bit conversion.

DBK modules share the same footprint as the DaqBook and a typical notebook PCs; allowing for convenient stacking. The majority of these modules have their own power supply; however, several options exist for packaging and powering the DBKs.

Reference Note:
DBK options are detailed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop.

Daq Software

The Daq devices have software options capable of handling most applications. Three types of software are available:

- ready-to-use graphical programs, e.g., DaqView, DaqViewXL, and post acquisition data analysis programs such as PostView, DIAdem, and eZ-PostView
- drivers for third-party, icon-driven software such as DASYLab and LabView
- various language drivers to aid custom programming using API

Ready-to-use programs are convenient for fill-in-the-blank applications that do not require programming for basic data acquisition and display:

- DaqView is a Windows-based program for basic set-up and data acquisition. DaqView lets you select desired channels, gains, transducer types (including thermocouples), and a host of other parameters with a click of a PC's mouse. DaqView lets you stream data to disk and display data in numerical or graphical formats. PostView is a post-acquisition waveform-display program within DaqView.
- DaqViewXL allows you to interface directly with Microsoft Excel to enhance data handling and display. Within Excel you have a full-featured Daq control panel and all the data display capabilities of Excel.
- Post acquisition data analysis programs, e.g., PostView, DIAdem, and eZ-PostView, typically allow you to view and edit post-acquisition data.
- The Daq Configuration control panel allows for interface configuration, testing, and troubleshooting.

Each Daq system comes with an Application Programming Interface (API). API-language drivers include C/C++ and Visual Basic. The latest software is a 32-bit version API.

Reference Notes:

- The software document modules, *DaqView*, *DaqViewXL*, and *Post Acquisition Data Analysis User's Guide*, are not included as part of the hardcopy manual, but are available in PDF version. See the PDF Note, below.
- Programming topics are covered in the *Programmer's User Manual* (1008-0901). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop.

PDF Note: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

Connections and Pinouts, DaqBoard/1000 Series 2

Overview …… 2-1
TB-100 Terminal Connector Option …… 2-2
Pinout for DaqBoard/1000 and DaqBoard/1005 …… 2-3

CAUTION

Turn off power to all devices connected to the system before connecting cables or setting configuration jumpers and switches. Electrical shock or damage to equipment can result even under low-voltage conditions.

CAUTION

The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Overview

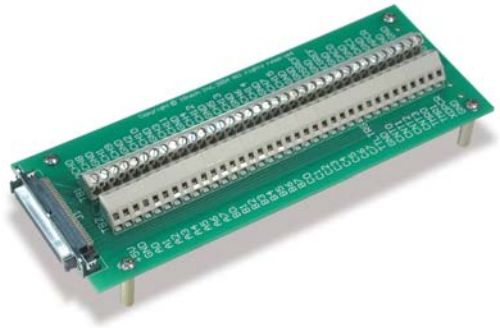
DaqBoard/1000 Series boards communicate [external from the host PC] through a 68-pin SCSI III connector. The TB-100 board is used to provide convenient screw-terminal connections for all signal I/O.

Pinouts for both the TB-100 and the DaqBoard/1000 Series boards follow.

Note that a TB-100 board can be easily connected to a DaqBopard/1000 or DaqBoard/1005 via a 68-conductor, shielded cable, p/n CA-G56. The cable has a length of three feet.

TB-100 Terminal Connector Option

The TB-100 Terminal Connector option can be used to connect all signal I/O lines that are associated with a DaqBoard/1000 Series device. TB-100 connects to the DaqBoard's 68-pin SCSI III connector via a shielded 3 ft., 68 conductor cable, p/n CA-G56.



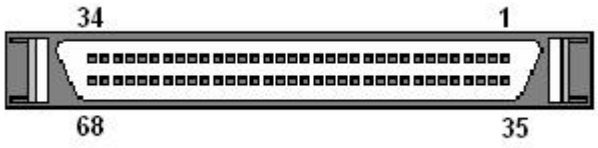
TB-100 Pinout The "Pin" column refers to the pin no. on the 68-Pin SCSI III Connector.

TB2 Side		Pin	TB1 Side		SE	DIFF	Pin
+5V	Vcc (+5 VDC)	19	ACH0	Analog Input	CH 0	0 HI	68
GND	Digital Common	Note 1	ACH8	Analog Input	CH 8	0 LO	34
A0	Digital I/O Line A0	18	AGND	Analog Com			Note 2
A1	Digital I/O Line A1	52	ACH1	Analog Input	CH 1	1 HI	33
A2	Digital I/O Line A2	17	ACH9	Analog Input	CH 9	1 LO	66
A3	Digital I/O Line A3	51	AGND	Analog Com			Note 2
A4	Digital I/O Line A4	16	ACH2	Analog Input	CH 2	2 HI	65
A5	Digital I/O Line A5	50	ACH10	Analog Input	CH 10	2 LO	31
A6	Digital I/O Line A6	15	AGND	Analog Com			Note 2
A7	Digital I/O Line A7	49	ACH3	Analog Input	CH 3	3 HI	30
B0	Digital I/O Line B0	14	ACH11	Analog Input	CH 11	3 LO	63
B1	Digital I/O Line B1	48	AGND	Analog Com			Note 2
B2	Digital I/O Line B2	13	ACH4	Analog Input	CH 4	4 HI	28
B3	Digital I/O Line B3	47	ACH12	Analog Input	CH 12	4 LO	61
B4	Digital I/O Line B4	12	AGND	Analog Com			Note 2
B5	Digital I/O Line B5	46	ACH5	Analog Input	CH 5	5 HI	60
B6	Digital I/O Line B6	11	ACH13	Analog Input	CH 13	5 LO	26
B7	Digital I/O Line B7	45	AGND	Analog Com			Note 2
C0	Digital I/O Line C0	10	ACH6	Analog Input	CH 6	6 HI	25
C1	Digital I/O Line C1	44	ACH14	Analog Input	CH 14	6 LO	58
C2	Digital I/O Line C2	9	AGND	Analog Com			Note 2
C3	Digital I/O Line C3	43	ACH7	Analog Input	CH 7	7 HI	57
C4	Digital I/O Line C4	8	ACH15	Analog Input	CH 15	7 LO	23
C5	Digital I/O Line C5	42	AGND	Analog Common			Note 2
C6	Digital I/O Line C6	7	SGND	Low Level Sense Common			62
C7	Digital I/O Line C7	41	POSREF	+5 VDC Positive Reference			20
TTLTRG	TTL Trigger Input	6	AGND	Analog Common			Note 2
GND	Digital Common	Note 1	NEGREF	- 5 VDC Negative Reference			54
CNT0	Counter Input CTR0	5	AGND	Analog Common			Note 2
CNT1	Counter Input CTR1	39	XDAC0	Analog Output, DAC0			22
CNT2	Counter Input CTR2	4	AGND	Analog Common			Note 2
CNT3	Counter Input CTR3	38	XDAC1	Analog Output, DAC1			21
TMR0	Timer Output 0	3	AGND	Analog Common			Note 2
TMR1	Timer Output 1	37	XAPCR	A/D Pacer Clock I/O			2
XDPCR	DAC Pacer Clock I/O	1	GND	Digital Common			Note 1
GND	Digital Common	Note 1	EGND	Earth Ground			N/A

Note 1: Digital Common Pins on the SCSI III connector are: 35, 36, and 40.

Note 2: Analog Common Pins on the SCSI III connector are: 24, 27, 29, 32, 56, 59, 64, and 67

Pinout for DaqBoard/1000 and DaqBoard/1005



Pin numbers refer to the 68-pin SCSI III female connector, located on the DaqBoard/1000 and DaqBoard/1005 boards.

Function	SE	DIFF	Pin		Pin	Function	SE	DIFF
Analog Input	CH 8	CH 0 LO	34		68	Analog Input	CH 0	CH 0 HI
Analog Input	CH 1	CH 1 HI	33		67	Analog Com		
Analog Com			32		66	Analog Input	CH 9	CH 1 LO
Analog Input	CH 10	CH 2 LO	31		65	Analog Input	CH 2	CH 2 HI
Analog Input	CH 3	CH 3 HI	30		64	Analog Com		
Analog Com			29		63	Analog Input	CH 11	CH 3 LO
Analog Input	CH 4	CH 4 HI	28		62	Low Level Sense Common		
Analog Com			27		61	Analog Input	CH 12	CH 4 LO
Analog Input	CH 13	CH 5 LO	26		60	Analog Input	CH 5	CH 5 HI
Analog Input	CH 6	CH 6 HI	25		59	Analog Com		
Analog Com			24		58	Analog Input	CH 14	CH 6 LO
Analog Input	CH 15	CH 7 LO	23		57	Analog Input	CH 7	CH 7 HI
Analog Output 0 (**DAC0**) Note 1			22		56	Analog Common		
Analog Output 1 (**DAC1**) Note 1			21		55	Analog Common		
5 VDC Positive Reference			20		54	-5 VDC Negative Reference		
Vcc (+5 VDC)			19		53	Digital Common		
Digital I/O line A0			18		52	Digital I/O line A1		
Digital I/O line A2			17		51	Digital I/O line A3		
Digital I/O line A4			16		50	Digital I/O line A5		
Digital I/O line A6			15		49	Digital I/O line A7		
Digital I/O line B0			14		48	Digital I/O line B1		
Digital I/O line B2			13		47	Digital I/O line B3		
Digital I/O line B4			12		46	Digital I/O line B5		
Digital I/O line B6			11		45	Digital I/O line B7		
Digital I/O line C0			10		44	Digital I/O line C1		
Digital I/O line C2			9		43	Digital I/O line C3		
Digital I/O line C4			8		42	Digital I/O line C5		
Digital I/O line C6			7		41	Digital I/O line C7		
TTL Trigger Input			6		40	Digital Common		
Counter Input CTR0			5		39	Counter Input CTR1		
Counter Input CTR2			4		38	Counter Input CTR3		
Timer Output 0			3		37	Timer Output 1		
A/D Pacer Clock Input/Output			2		36	Digital Common		
DAC Pacer Clock I/O			1		35	Digital Common		

Note 1: DAC0 and DAC1 apply to DaqBoard/1000. They do not apply to DaqBoard/1005.

Notes

Connections and Pinouts, DaqBoard/2000 Series 3

Overview …… 3-1
DBK200 Series, P4 Connector Options …… 3-2
Pinouts for DaqBoard/2000 Series and /2000c Series Boards …… 3-8

CAUTION

Turn off power to all devices connected to the system before connecting cables or setting configuration jumpers and switches. Electrical shock or damage to equipment can result even under low-voltage conditions.

CAUTION

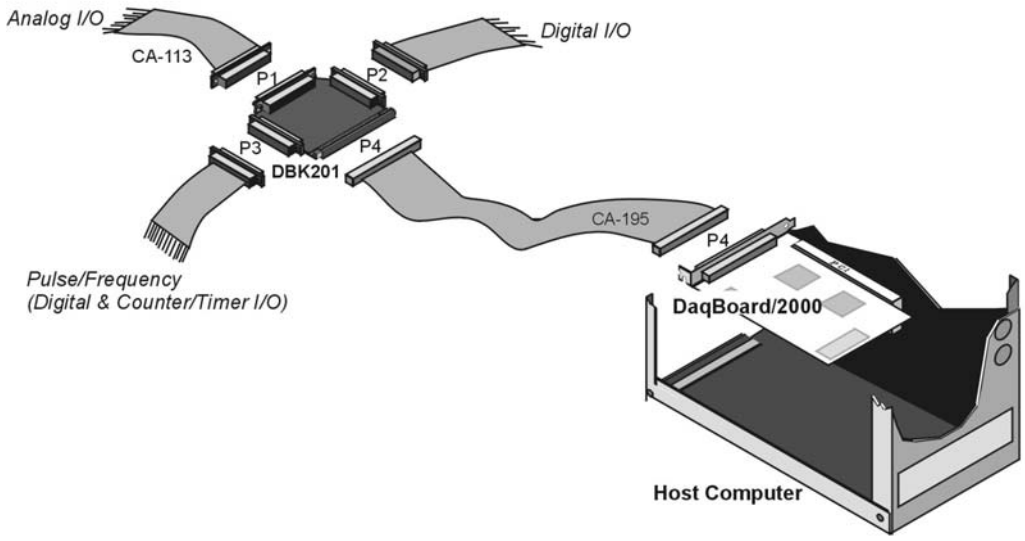
The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Overview

DaqBoard/2000 Series and DaqBoard/2000c Series boards communicate [external from the host PC] through the board's 100-pin P4 connector. Typically, a DBK200 Series P4-adapter is used to provide one or more DB37 connectors (P1, P2, P3), which are subsets of the 100-pin P4 connector.

Pinouts for P1, P2, P3, and P4 are located after the following DBK200 Series board descriptions.

DaqBoard/2000 Series and cPCI DaqBoard/2000c Series boards communicate [external from the host PC] through the board's 100-pin P4 connector. Typically a DBK200 Series P4-adapter is used to provide one or more DB37 connectors (P1, P2, P3).



Using a DBK201 P4-to-P1/P2/P3 Adapter

The following matrix provides a quick comparison of the DBK200 Series adapter boards. Details for each board are provided in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). An illustration and brief discussion of each DBK200 Series adapter board is presented after the following table.

DBK200 Series, Adapter Board Matrix

DBK	P1 Analog	P2 Digital	P3 Pulse, Freq., Digital	P4	Screw Term-inals	Special Features	Comments
200	Yes	No	No	Yes	No	No	Analog I/O use only.
201	Yes	Yes	Yes	Yes	No	No	Like DBK209, except for form-factor.
202 **203** **204**	Yes	Yes	40-pin header for P3	Yes	Yes	Custom RC Filter Setup.	DBK202 is a bare board. DBK203 consists of a DBK202 mounted in a chassis. DBK204 consists of a DBK203 and a CA-209 CE cable kit.
205	No	No	12 screw-term.	Yes	Yes	No	Only used with DaqBoard/2003 or /2003c. Can plug directly into P4. Screw terminals are related to P3.
206	Yes	Yes	Yes	Yes	Yes	No	Similar to DBK202, but has a different form-factor and has no RC filter setup.
207 **207/CJC**	Yes (Qty. 2)	No	No	Yes	Yes	Can carry 5B modules.	Supports 5B-compatible Analog I/O modules. DBK207/CJC includes Cold Junction Compensation. Includes two P1 connectors. Screw terminals are for 5B module connections.
208	No	Yes (Qty. 2)	No	Yes	Yes	Can carry relay modules.	Supports Opto-22 compatible Solid-State-Relay (SSR) digital modules. Includes two P2 connectors.
209	Yes	Yes	Yes	Yes	No	No	Like DBK201, except for form-factor.
210	Yes	Yes (Qty. 2)	No	Yes	Yes	Can carry digital I/O modules.	Supports 32 channels of digital I/O via Grayhill™ 70M-Series mini-modules.

DBK200 Series, P4 Connector Options

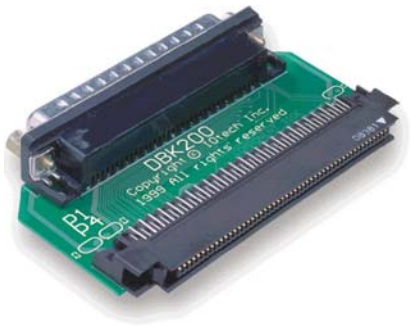
Reference Note: Prior to connecting a DBK to a DaqBoard/2000 Series or /2000c Series board, refer to the applicable DBK document module(s), in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). During software installation, the manual is automatically installed onto your hard drive as a part of product support. The default location is the **Programs** directory, which can be accessed through the Windows Desktop.

DBK200

The DBK200 P4-to-P1 adapter board provides a DB37 P1 connector.

P1 is suitable for ANALOG/IO.
DBK200 does not support Digital I/O or frequency signals.

DBK200's P4 (100-pin connector) connects to the DaqBoard/2000 Series or DaqBoard/2000c Series board's P4 connector via a CA-195 Cable.



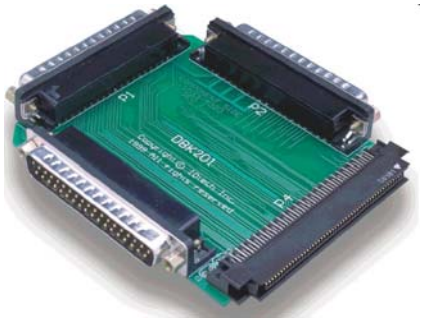
DBK200 Adapter with P1

DBK201

The DBK201 P4-to-P1/P2/P3 adapter provides DB37 P1, P2, and P3 connectors.

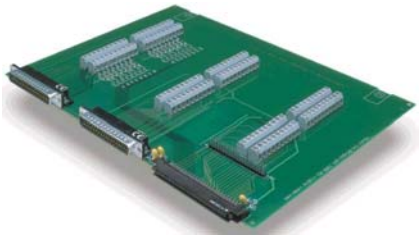
- P1 is used for ANALOG I/O.
- P2 is used for DIGITAL I/O.
- P3 is used for Pulse/Frequency (Digital and Counter/Timer) I/O.

DBK201's P4 (100-pin connector) connects to a DaqBoard/2000 Series or /2000c Series board's P4 connector via a CA-195 Cable.



DBK201, P4-to-P1/P2/P3 Adapter

DBK202, DBK203, and DBK204



DBK202

P4-to-P1/P2/P3 Adapter with Screw-Terminals and Locators for RC Filter Setup

DBK203, with Cover Plate Removed [1]

Chassis-Mounted P4-to-P1/P2/P3 Adapter with Screw-Terminals and Locators for RC Filter Setup

[1] **Note**: The DBK203, DBK204, and DBK204c modules are identical. The DBK204 designation indicates that the module includes a CE cable kit for use with DaqBoard/2000 Series boards that are of the standard PCI type. The DBK204c designation indicates that the module includes a CE cable kit for use with the compact-PCI type boards, i.e., the DaqBoard/2000c Series.

The DBK202, DBK203, DBK204, and DBK204c adapters each provide a DB37 P1 connector, DB37 P2 connector, and a 40-pin header (designated as P3).

- P1 is used for ANALOG I/O
- P2 for DIGITAL I/O
- P3 for Pulse/Frequency (Digital and Counter/Timer) I/O

In addition to the P1, P2, and P3 connectors, these boards include terminal blocks designated TB1 through TB12. The blocks provide a screw-terminal connection option for P1, P2, and P3.

Each of the three adapters can be connected to the DaqBoard/2000 Series or /2000c Series 100-pin P4 connector via a CA-195 cable.

Note: These screw-terminal adapter boards provide a means of connecting signals to a DaqBoard/2000 Series or a /2000c Series board through one of three methods:

- Cables connected to P1, P2, and P3 connectors, as applicable.
- Signal wires connected to the appropriate screw-terminal blocks (TB1 through TB12). The board's silkscreen identifies all screw terminals.
- With a combination of the above two methods.

Note: Board images are not to the same scale.

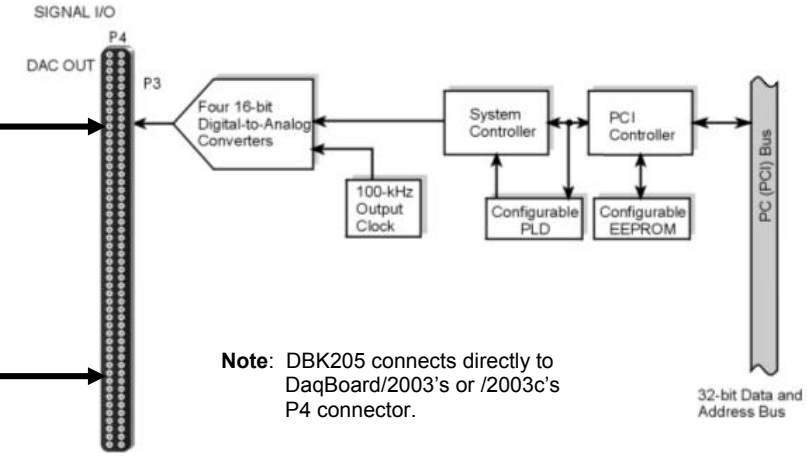
DBK205

The DBK205 provides 12 screw-terminal connections on one terminal block (TB1) for DaqBoard/2003 and DaqBoard/2003c. The signal lines on DBK205's P4 connector correspond with *P3-associated pins* on the P4 connector of DaqBoard/2003 and /2003c. The DBK205 can connect directly to the 100-pin P4 connector on the DaqBoard/2003, or DaqBoard/2003c.

DBK205 Terminations

TB1-1	AGND
TB1-2	DAC0
TB1-3	AGND
TB1-4	DAC1
TB1-5	AGND
TB1-6	DAC2
TB1-7	AGND
TB1-8	DAC3
TB1-9	AGND
TB1-10	XTTL
TB1-11	CLK
TB1-12	DGND

DBK205 Adapter

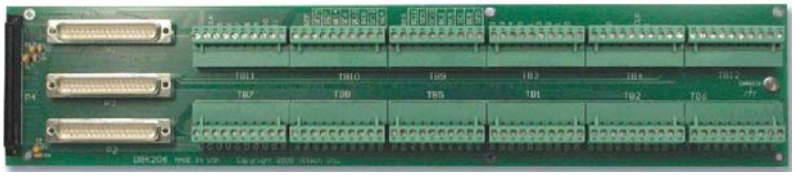


DaqBoard/2003 Block Diagram

DBK206

The DBK206 provides a P1, P2, and P3 connector and corresponding screw-terminal blocks.

- P1 is used for ANALOG I/O
- P2 for DIGITAL I/O
- P3 for Pulse/Frequency (Digital and Counter/Timer) I/O



DBK206, P4-to-P1/P2/P3 Adapter with Screw-Terminals

The DBK206 is suitable for both analog and digital expansion. Signal connection to a DaqBoard/2000 Series or to a DaqBoard/2000c Series board can be made as follows:

- With cables connected to P1, P2, and P3 connectors, as applicable.
- With signal wires connected to the appropriate screw-terminal blocks (TB1 through TB12). Note that the DBK206 board's silkscreen identifies all screw terminals.
- With a combination of the above two methods.

Regardless of which method is used, the DBK206 connects to the 100-pin P4 connector of a DaqBoard/2000 Series or a /2000c Series board. The connection is made via a CA-195 cable. The board contains mounting holes that allow the board to be secured inside a user-provided enclosure.

Note: Board images are not to the same scale.

DBK207 and DBK207/CJC

The DBK207 and DBK207/CJC are carrier boards for 5B-compatible analog input modules. They each provide:

- two P1 connectors – for ANALOG I/O
- a 5 VDC power terminal
- footprints for sixteen 5B Modules
- 16 terminal blocks.

In addition, DBK207/CJC provides Cold Junction Compensation. The DBK207 and DBK207/CJC each include a 100-pin P4 connector for use with DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards.

DBK207/CJC Carrier Board for 5B Compatible Modules

WARNING

Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads. Do not operate such switch-loads unless emergency over-ride circuitry is present.

DBK207 and DBK207/CJC are typically installed in NEMA-type panels; however, they may be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

DBK207 and DBK207/CJC allow Daq-based acquisition systems to use various combinations of sixteen 5B signal-conditioning modules. 5B modules can accommodate a variety of signals, including low-level thermocouple and strain-gage signals. Configuration options are flexible. You can select the type of signal attached to each channel. One Daq device can support up to 16 DBK207 [or DBK207/CJC] boards, providing a maximum of 256 isolated, analog input channels. Note that Daq devices scan the channels at the same 10 µs/channel rate as other DBKs (256 scans in 2.56 ms in a full system).

Each user-installed 5B module offers 500 V isolation from the system and between channels. Both DBK207 and DBK207/CJC include 16 screw-terminal blocks for signal inputs. In addition, the DBK207/CJC includes cold junction compensators (CJCs) for use with thermocouple 5B modules. Sockets are provided for user-installed AC1362 current-sense resistor modules, as discussed in *5B Module Connection* in the DBK207 section of the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).

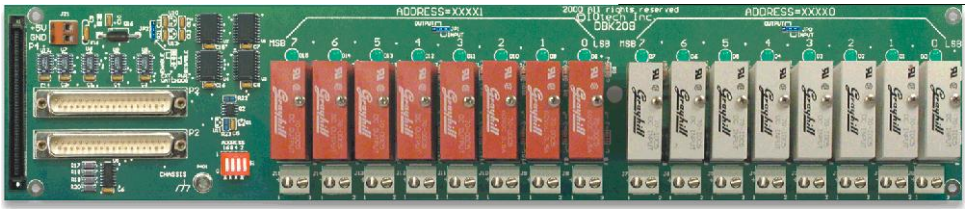
DBK208

DBK208 is a two-bank carrier board for optically-isolated Solid-State-Relay (SSR) modules. Each bank supports up to eight digital I/O modules. The banks can be independently set as "input" or "output" via jumpers (JP0 for Bank 0, and JP1 for Bank 1). The I/O modules are industry standard Opto-22 compatible, 5-volt logic level modules.

The DBK208 provides:

- two P2 connectors for DIGITAL I/O
- footprints for sixteen optically-isolated Solid-State-Relay (SSR) Modules
- 16 dual-screw terminal blocks.

DBK208 includes a 100-pin P4 connector for use with DaqBoard/2000 Series and /2000c Series Boards.



DBK208 Carrier Board for Opto-22 Compatible Solid-State-Relays

WARNING

Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads. Do not operate such switch-loads unless emergency over-ride circuitry is present.

Note: DBK208 is not used with DaqBoard/2003.

DBK208 boards are typically installed in NEMA-type panels; however, they may alternatively be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

In regard to the DaqBoard/2000 Series and DaqBoard/2000c Series boards, control originates in the board's 100-pin P4 connector. Connection of these boards to DBK208 can be made directly or indirectly as follows:

- Direct connection can be made from the DaqBoard/2000 Series or /2000c Series board's 100-pin P4 connector to a DBK208's P4 connector via a CA-195 cable.
- Indirect connection can be made using an additional DBK200 Series P4-adapter that includes a 37-pin P2 connector. For example, one of the following could be used: DBK201, DBK202, DBK203, DBK204, DBK206, DBK209, or another DBK208. CA-37 cables are used to connect from P2 to P2.

Note that a single Daq-based data acquisition system can support up to 16 DBK208 boards, providing a total of 256 channels. DBK208 boards contain two DB37 P2 connectors for the purpose of daisy-chaining to other DBK208s or to other P2-supported devices.

DBK209

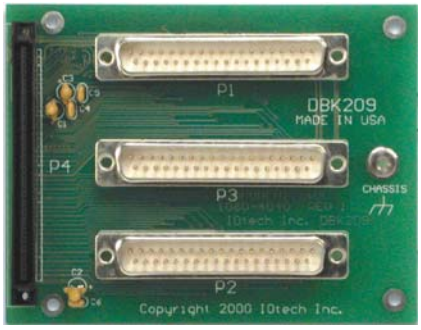
The DBK209 is a mini-adapter board suitable for both analog and digital expansion. The board provides three DB37 connectors (P1, P2, and P3).

DBK209 connects to DaqBoard/2000 Series or /2000c Series P4 connector via a CA-195 cable.

Other than the form factor, DBK209 is identical to DBK201.

- P1 is used for ANALOG I/O.
- P2 is used for DIGITAL I/O.
- P3 is used for Pulse/Frequency (Digital and Counter/Timer) I/O.

DBK209's P4 (100-pin connector) connects to the DaqBoard/2000 Series or /2000c Series board's P4 connector via a CA-195 Cable.



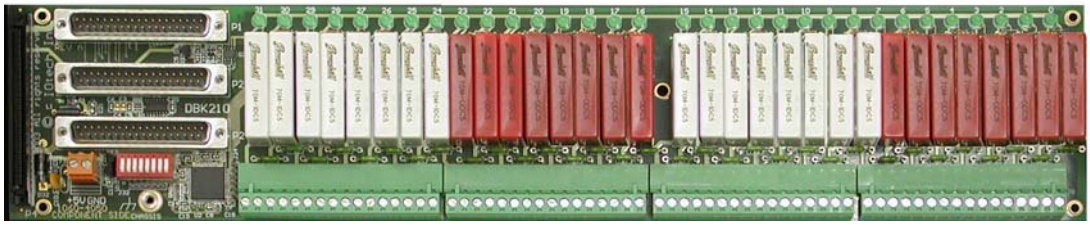
DBK209
P4-to-P1/P2/P3 Mini-adapter Board

DBK210

DBK210 is a four-bank carrier board for optically-isolated Grayhill 70M-Series mini-modules. Each bank supports up to eight digital I/O modules. Each bank can be independently set to input or output. The settings are made via micro-switches. The Grayhill 70M-Series I/O modules are industry standard, 5-volt logic level modules.

DBK210 boards are typically installed in NEMA-type panels; however, they can be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

DBK210 boards contain three DB37 connectors, as follows: two P2 connectors for daisy-chaining to other DBK210s or to other P2-supported devices; one P1 connector for convenient access to the analog input channels of a DaqBook/2000 Series or a DaqBoard/2000 Series device.



DBK210 Carrier Board for Grayhill 70M-Series Mini-Modules

Reference Notes: You must set up *DaqView* for the particular DBKs in your system. If you are unfamiliar with the method of setting up DBKs in *DaqView*, or if you need a refresher, refer to the following documents as needed.

- The *DBK Set Up in DaqView* chapter of the *DBK Option Cards Modules User's Manual* (p/n 457-0905),
- The *DBK Option Cards Modules User's Manual* (p/n 457-0905), for the applicable DBK document module(s). The documentation discusses hardware configuration aspects that require setup in software.
- The *DaqView* document module.

During software installation, documentation is automatically installed onto your hard drive as a part of product support. The default location is the **Programs** directory, which can be accessed through the Windows Desktop.

Note: As new DBKs become available, be sure to use the latest revision of *DaqView* with the proper configuration options.

The following P1, P2, and P3 connector pinouts pertain to the DBK200 Series adapter boards that were discussed in the first part of this chapter. P1, P2, and P3 are subset connectors of the 100-pin P4 connector found on the DaqBoard/2000 Series and /2000c Series boards, and for that reason P4 pin-correlation is provided.

CAUTION

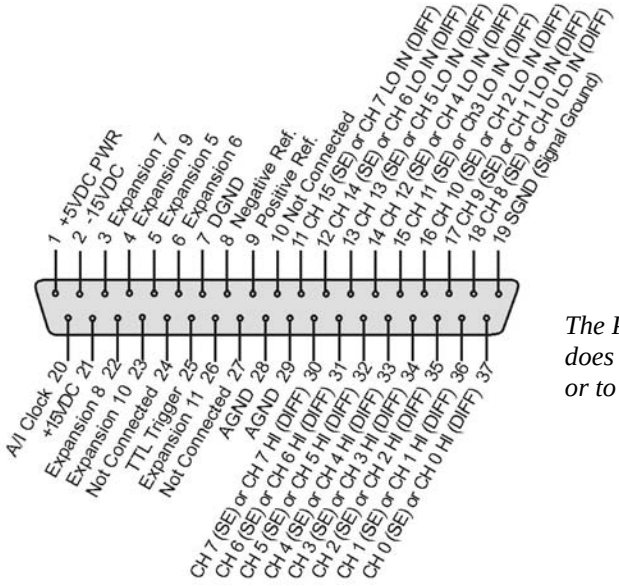
Do not confuse connectors. Ensure that you only connect P1 I/Os to P1, P2 I/Os to P2, and P3 I/Os to P3. Improper connection may result in equipment damage.

Note: In the pinouts that follow, some pins are irrelevant to certain DaqBoards. For example: DaqBoard/2002, /2002c, /2004, and 2004c have no P1 correlation; and for those boards P1 and the associated P4 pins should be ignored. The DaqBoard/2003 and /2003c only relate to P3 and the associated P4 pins; but for these two boards, a DBK205 screw-terminal adapter is typically used (see page 3-3). Note that chapter 1, *Device Systems and Device Overviews*, contains detailed information that is specific to each board.

P1

The P1 DB37 connector is obtained with the use of one of the following:

DBK200
DBK201
DBK202
DBK203
DBK204
DBK206
DBK207
DBK207/CJC
DBK209



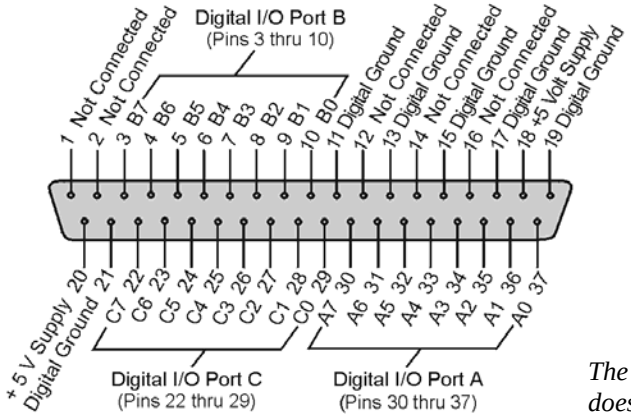
The P1 DB37 connector does not apply to DBK205 or to DBK208.

Pin	Signal Name	Description for P1 Pin Use	P4 Correlation
1	+5 Volts	Expansion +5 V power (Refer to *Power Management*, chapter 2, in DBK Manual)	A1
2	-15 Volts	Expansion -15 VDC power (Refer to *Power Management*, ch. 2, in DBK Manual)	A48
3	Expansion 7	Digital OUT, external ADDRESS select bit 3	B32
4	Expansion 9	Digital OUT, external ADDRESS select bit 1	B33
5	Expansion 5	Digital OUT, external GAIN select bit 1	B31
6	Expansion 6	Digital OUT, external GAIN select bit 0	A32
7	Ground	Common *See Ground Correlation Tables, page 3-15.*	⇐
8	Negative Reference	Analog, -5 V reference	A36
9	Positive Reference	Analog +5V reference	B35
10	Not Connected	N/A	N/A
11	CH 15 (SE), or CH 7 LO DIFF	Ch 15 HI IN (single-ended mode) / Ch 7 LO IN (differential mode)	B36
12	CH 14 (SE), or CH 6 LO DIFF	Ch 14 HI IN (single-ended mode) / Ch 6 LO IN (differential mode)	A38
13	CH 13 (SE), or CH 5 LO DIFF	Ch 13 HI IN (single-ended mode) / Ch 5 LO IN (differential mode)	B39
14	CH 12 (SE), or CH 4 LO DIFF	Ch 12 HI IN (single-ended mode) / Ch 4 LO IN (differential mode)	A41
15	CH 11 (SE), or CH 3 LO DIFF	Ch 11 HI IN (single-ended mode) / Ch 3 LO IN (differential mode)	B42
16	CH 10 (SE), or CH 2 LO DIFF	Ch 10 HI IN (single-ended mode) / Ch 2 LO IN (differential mode)	A44
17	CH 9 (SE), or CH 1 LO DIFF	Ch 9 HI IN (single-ended mode) / Ch 1 LO IN (differential mode)	B45
18	CH 8 (SE), or CH 0 LO DIFF	Ch 8 HI IN (single-ended mode) / Ch 0 LO IN (differential mode)	A47
19	Signal Ground (SGND)	Sense Common (SGND)	A45
20	A/I Clock	External ADC Pacer Clock Input / Internal ADC Pacer Clock Output	B26
21	+15 Volts	Expansion +15 V power (Refer to *Power Management*, chapter 2, in DBK Manual)	B48
22	Expansion 8	Digital OUT, external ADDRESS select bit 2	A33
23	Expansion 10	Digital OUT, external ADDRESS select bit 0	A34
24	Not Connected	N/A	N/A
25	TTL Trigger	Digital IN, External TTL Trigger Input	A27
26	Expansion 11	Digital OUT, Simultaneous sample and hold (SSH)	B34
27	Not Connected	N/A	N/A
28	Ground	Common *See Ground Correlation Tables, page 3- 15.*	⇐
29	Ground	Common *See Ground Correlation Tables, page 3-15.*	⇐
30	CH 7 (SE), or CH 7 HI DIFF	Ch 7 IN (single-ended mode) / Ch 7 HI IN (differential mode)	A37
31	CH 6 (SE), or CH 6 HI DIFF	Ch 6 IN (single-ended mode) / Ch 6 HI IN (differential mode)	B38
32	CH 5 (SE), or CH 5 HI DIFF	Ch 5 IN (single-ended mode) / Ch 5 HI IN (differential mode)	A40
33	CH 4 (SE), or CH 4 HI DIFF	Ch 4 IN (single-ended mode) / Ch 4 HI IN (differential mode)	B41
34	CH 3 (SE), or CH 3 HI DIFF	Ch 3 IN (single-ended mode) / Ch 3 HI IN (differential mode)	A43
35	CH 2 (SE), or CH 2 HI DIFF	Ch 2 IN (single-ended mode) / Ch 2 HI IN (differential mode)	B44
36	CH 1 (SE), or CH 1 HI DIFF	Ch 1 IN (single-ended mode) / Ch 1 HI IN (differential mode)	A46
37	CH 0 (SE), or CH 0 HI DIFF	Ch 0 IN (single-ended mode) / Ch 0 HI IN (differential mode)	B47

P2

The P2 DB37 connector is obtained with the use of one of the following:

DBK201
DBK202
DBK203
DBK204
DBK206
DBK208
DBK209



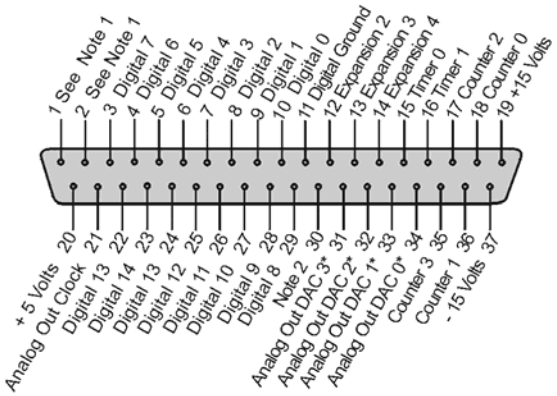
The P2 DB37 connector does not apply to DBK200, DBK205, DBK207, or DBK207/CJC.

Pin	Signal Name	Description for P2 Pin Use	P4 Correlation
1	Not Connected	N/A	N/A
2	Not Connected	N/A	N/A
3	Port B - B7	Digital I/O: P2 Digital Port B, Bit 7; or, P2 Expansion Address Bit 0 Out	B10
4	Port B - B6	Digital I/O: P2 Digital Port B, Bit 6; or, P2 Expansion Address Bit 1 Out	A11
5	Port B - B5	Digital I/O: P2 Digital Port B, Bit 5; or, P2 Expansion Address Bit 2 Out	B11
6	Port B - B4	Digital I/O: P2 Digital Port B, Bit 4; or, P2 Expansion Address Bit 3 Out	A12
7	Port B - B3	Digital I/O: P2 Digital Port B, Bit 3; or, P2 Expansion Address Bit 4 Out	B12
8	Port B - B2	Digital I/O: P2 Digital Port B, Bit 2; or, P2 Expansion RESET Output	A13
9	Port B - B1	Digital I/O: P2 Digital Port B, Bit 1; or, P2 Expansion WRITE Output	B13
10	Port B - B0	Digital I/O: P2 Digital Port B, Bit 0; or, P2 Expansion READ Output	A14
11	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
12	Not Connected	N/A	N/A
13	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
14	Not Connected	N/A	N/A
15	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
16	Not Connected	N/A	N/A
17	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
18	+ 5 Volt Supply	Expansion +5 Volt Power (Refer to *Power Management*, ch. 2, in DBK Manual)	A1, B1
19	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
20	+ 5 Volt Supply	Expansion +5 Volt Power (Refer to *Power Management*, ch. 2, in DBK Manual)	A1, B1
21	Ground	Digital Common *See Ground Correlation Tables, page 3- 15.*	⇐
22	Port C - C7	Digital I/O: P2 Digital Port C, Bit 7; or, P2 Expansion Data Bit 7	A6
23	Port C - C6	Digital I/O: P2 Digital Port C, Bit 6; or, P2 Expansion Data Bit 6	B6
24	Port C - C5	Digital I/O: P2 Digital Port C, Bit 5; or, P2 Expansion Data Bit 5	A7
25	Port C - C4	Digital I/O: P2 Digital Port C, Bit 4; or, P2 Expansion Data Bit 4	B7
26	Port C - C3	Digital I/O: P2 Digital Port C, Bit 3; or, P2 Expansion Data Bit 3	A8
27	Port C - C2	Digital I/O: P2 Digital Port C, Bit 2; or, P2 Expansion Data Bit 2	B8
28	Port C - C1	Digital I/O: P2 Digital Port C, Bit 1; or, P2 Expansion Data Bit 1	A9
29	Port C - C0	Digital I/O: P2 Digital Port C, Bit 0; or, P2 Expansion Data Bit 0	B9
30	Port A - A7	Digital I/O: P2 Digital Port A, Bit 7; or, P2 Expansion Data Bit 15	A2
31	Port A - A6	Digital I/O: P2 Digital Port A, Bit 6; or, P2 Expansion Data Bit 14	B2
32	Port A - A5	Digital I/O: P2 Digital Port A, Bit 5; or, P2 Expansion Data Bit 13	A3
33	Port A - A4	Digital I/O: P2 Digital Port A, Bit 4; or, P2 Expansion Data Bit 12	B3
34	Port A - A3	Digital I/O: P2 Digital Port A, Bit 3; or, P2 Expansion Data Bit 11	A4
35	Port A - A2	Digital I/O: P2 Digital Port A, Bit 2; or, P2 Expansion Data Bit 10	B4
36	Port A - A1	Digital I/O: P2 Digital Port A, Bit 1; or, P2 Expansion Data Bit 9	A5
37	Port A - A0	Digital I/O: P2 Digital Port A, Bit 0; or, P2 Expansion Data Bit 8	B5

P3

The P3 DB37 connector is obtained with the use of one of the following:

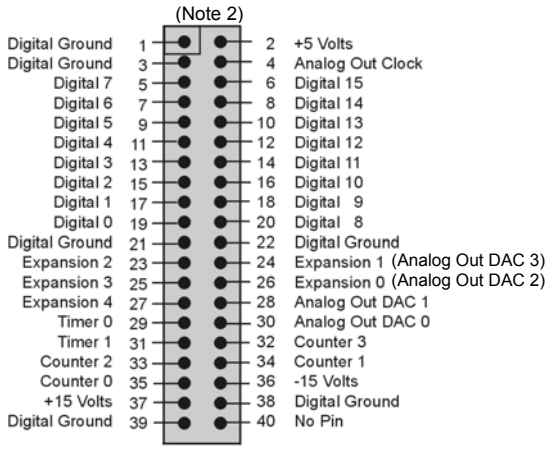
DBK201
DBK202 (Note 1)
DBK203 (Note 1)
DBK204 (Note 1)
DBK206
DBK209



DB37 P3 Connector

Note: There is no direct pin number correlation between the 40-pin header and the DB37 P3 connector.

*****In regard to pins 31 through 34, see Note 3.



DBK202, DBK203, DBK204 "On-Board" 40-Pin Header

The P3 DB37 connector does not apply to DBK200, DBK205, DBK207, DBK207/CJC, or DBK208.

Pin	Signal Name	Description for P3 Pin Use	P4 Correlation
1	Digital Ground (Note 1)	Digital Common *See Ground Correlation Tables, page 3-15.*	⇐
2	Digital Ground (Note 1)	Digital Common *See Ground Correlation Tables, page 3-15.*	⇐
3	Digital 7	P3 Digital Port Bit 7	B19
4	Digital 6	P3 Digital Port Bit 6	A19
5	Digital 5	P3 Digital Port Bit 5	B20
6	Digital 4	P3 Digital Port Bit 4	A20
7	Digital 3	P3 Digital Port Bit 3	B21
8	Digital 2	P3 Digital Port Bit 2	A21
9	Digital 1	P3 Digital Port Bit 1	B22
10	Digital 0	P3 Digital Port Bit 0	A22
11	Digital Ground	Digital Common *See Ground Correlation Tables, page 3-15.*	⇐
12	Expansion 2	Reserved	---
13	Expansion 3	Reserved	---
14	Expansion 4	Reserved	---
15	Timer 0	P3 Timer 0 Output	B24
16	Timer 1	P3 Timer 1 Output	A25
17	Counter 2	P3 Counter 2 Input	B28
18	Counter 0	P3 Counter 0 Input	B29
19	+ 15 Volts	Expansion, +15 VDC	B48
20	+ 5 Volt Supply	Expansion, +5 Volt Power (Refer to *Power Management*, ch. 2, in DBK Manual)	A1, B1
21	Analog Out Clock	External DAC Pacer Clock Input/Internal DAC Pacer Clock Output	A26
22	Digital 15	Digital I/O; P3 Digital Port Bit 15	B15
23	Digital 14	Digital I/O; P3 Digital Port Bit 14	A15
24	Digital 13	P3 Digital Port Bit 13	B16
25	Digital 12	P3 Digital Port Bit 12	A16
26	Digital 11	P3 Digital Port Bit 11	B17
27	Digital 10	P3 Digital Port Bit 10	A17
28	Digital 9	P3 Digital Port Bit 9	B18
29	Digital 8	P3 Digital Port Bit 8	A18
30	Digital Ground	Digital Common *See Ground Correlation Tables, page 3-15.*	⇐
31	Analog Out DAC 3 (Note 3)	Analog DAC 3 Output	B50
32	Analog Out DAC 2 (Note 3)	Analog DAC 2 Output	B49
33	Analog Out DAC 1 (Note 3)	Analog DAC 1 Output	A50
34	Analog Out DAC 0 (Note 3)	Analog DAC 0 Output	A49
35	Counter 3	P3 Counter 3 Input	A28
36	Counter 1	P3 Counter 1 Input	A29
37	- 15 Volts	Expansion, - 15 VDC Power (Refer to *Power Management*, ch. 2, in DBK Manual)	A48

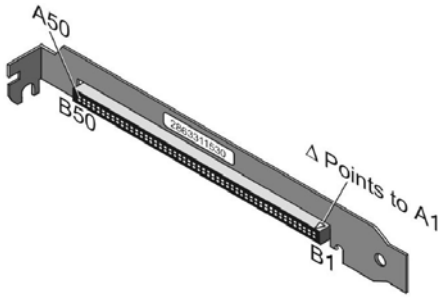
Note 1: P3 pins 1 and 2 are not connected on DBK201.

Note 2: For DBK202, DBK203, and DBK204, the 37-pin P3 connector is obtained by connecting a CA-60 cable to an "On-Board" 40-pin header.

Note 3: Pins 31, 32, 33, and 34 on the P3 DB37 connector are used for Analog Out DACs. DaqBoard/2001, /2003 & /2004 can utilize all four pins. DaqBoard/2000 does not make use of pins 31 or 32. DaqBoard/2002 and DaqBoard/2005 boards do not make use of pins 31 through 34 as these series two boards have no Analog Out DAC.

P4 to P1, P2 and P3 Correlation

The following table lists the correlation between the P4 I/O lines and their respective P1, P2 and P3 pin locations on the DBK200 Series boards. Ground correlation is provided in a subsequent table.



P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
A1	+5VDC	Power	Expansion +5 Volts	P1 pin 1 P2 pin 18, 20 P3 pin 20
B1	+5VDC	Power	Expansion +5 Volts	P1 pin 1 P2 pin 18, 20 P3 pin 20
A2	Port A bit 7	Dig I/O	P2 Digital Port A, bit 7 -or- P2 expansion Data bit 15	P2 pin 30
B2	Port A bit 6	Dig I/O	P2 Digital Port A, bit 6 -or- P2 expansion Data bit 14	P2 pin 31
A3	Port A bit 5	Dig I/O	P2 Digital Port A, bit 5 -or- P2 expansion Data bit 13	P2 pin 32
B3	Port A bit 4	Dig I/O	P2 Digital Port A, bit 4 -or- P2 expansion Data bit 12	P2 pin 33
A4	Port A bit 3	Dig I/O	P2 Digital Port A, bit 3 -or- P2 expansion Data bit 11	P2 pin 34
B4	Port A bit 2	Dig I/O	P2 Digital Port A, bit 2 -or- P2 expansion Data bit 10	P2 pin 35
A5	Port A bit 1	Dig I/O	P2 Digital Port A, bit 1 -or- P2 expansion Data bit 9	P2 pin 36
B5	Port A bit 0	Dig I/O	P2 Digital Port A, bit 0 -or- P2 expansion Data bit 8	P2 pin 37
A6	Port C bit 7	Dig I/O	P2 Digital Port C, bit 7 -or- P2 expansion Data bit 7	P2 pin 22
B6	Port C bit 6	Dig I/O	P2 Digital Port C, bit 6 -or- P2 expansion Data bit 6	P2 pin 23
A7	Port C bit 5	Dig I/O	P2 Digital Port C, bit 5 -or- P2 expansion Data bit 5	P2 pin 24
B7	Port C bit 4	Dig I/O	P2 Digital Port C, bit 4 -or- P2 expansion Data bit 4	P2 pin 25
A8	Port C bit 3	Dig I/O	P2 Digital Port C, bit 3 -or- P2 expansion Data bit 3	P2 pin 26
B8	Port C bit 2	Dig I/O	P2 Digital Port C, bit 2 -or- P2 expansion Data bit 2	P2 pin 27
A9	Port C bit 1	Dig I/O	P2 Digital Port C, bit 1 -or- P2 expansion Data bit 1	P2 pin 28
B9	Port C bit 0	Dig I/O	P2 Digital Port C, bit 0 -or- P2 expansion Data bit 0	P2 pin 29
A10	Ground	Dig I/O	Digital Common	*See Ground Tables*
B10	Port B bit 7	Dig I/O	P2 Digital Port B, bit 7 -or- P2 expansion address bit 0	P2 pin 3
A11	Port B bit 6	Dig I/O	P2 Digital Port B, bit 6 -or- P2 expansion address bit 1	P2 pin 4
B11	Port B bit 5	Dig I/O	P2 Digital Port B, bit 5 -or- P2 expansion address bit 2	P2 pin 5
A12	Port B bit 4	Dig I/O	P2 Digital Port B, bit 4 -or- P2 expansion address bit 2	P2 pin 6
B12	Port B bit 3	Dig I/O	P2 Digital Port B, bit 3 -or- P2 expansion address bit 3	P2 pin 7

This table is continued.

P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
A13	Port B bit 2	Dig I/O	P2 Digital Port B, bit 2 -or- P2 expansion RESET	P2 pin 8
B13	Port B bit 1	Dig I/O	P2 Digital Port B, bit 1 -or- P2 expansion WRITE	P2 pin 9
A14	Port B bit 0	Dig I/O	P2 Digital Port B, bit 0 -or- P2 expansion READ	P2 pin 10
B14	Ground	Dig I/O	Digital Common	*See Ground Tables*
A15	P3 Dig bit 14	Dig I/O	P3 Digital Port bit 14	P3 pin 23
B15	P3 Dig bit 15	Dig I/O	P3 Digital Port bit 15	P3 pin 22
A16	P3 Dig bit 12	Dig I/O	P3 Digital Port bit 12	P3 pin 25
B16	P3 Dig bit 13	Dig I/O	P3 Digital Port bit 13	P3 pin 24
A17	P3 Dig bit 10	Dig I/O	P3 Digital Port bit 10	P3 pin 27
B17	P3 Dig bit 11	Dig I/O	P3 Digital Port bit 11	P3 pin 26
A18	P3 Dig bit 8	Dig I/O	P3 Digital Port bit 8	P3 pin 29
B18	P3 Dig bit 9	Dig I/O	P3 Digital Port bit 9	P3 pin 28
A19	P3 Dig bit 6	Dig I/O	P3 Digital Port bit 6	P3 pin 4
B19	P3 Dig bit 7	Dig I/O	P3 Digital Port bit 7	P3 pin 3
A20	P3 Dig bit 4	Dig I/O	P3 Digital Port bit 4	P3 pin 6
B20	P3 Dig bit 5	Dig I/O	P3 Digital Port bit 5	P3 pin 5
A21	P3 Dig bit 2	Dig I/O	P3 Digital Port bit 2	P3 pin 8
B21	P3 Dig bit 3	Dig I/O	P3 Digital Port bit 3	P3 pin 7
A22	P3 Dig bit 0	Dig I/O	P3 Digital Port bit 0	P3 pin 10
B22	P3 Dig bit 1	Dig I/O	P3 Digital Port bit 1	P3 pin 9
A23	Ground	Dig I/O	Digital Common	*See Ground Tables*
B23	XCK	Dig I/O	Reserved	No Connection
A24	Ground	Dig I/O	Digital Common	*See Ground Tables*
B24	Timer 0	Dig OUT	P3 Timer 0 Output	P3 pin 15
A25	Timer 1	Dig OUT	P3 Timer 1 Output	P3 pin 16
B25	Ground	Dig I/O	Digital Common	*See Ground Tables*
A26	DAC Pacer	Dig I/O	External DAC Pacer Clock Input / Internal DAC Pacer Output	P3 pin 21
B26	ADC Pacer	Dig I/O	External ADC Pacer Clock Input / Internal ADC Pacer Output	P1 pin 20
A27	TTL Trigger	Dig IN	External TTL Trigger Input	P1 pin 25
B27	Ground	Dig I/O	Digital Common	*See Ground Tables*
A28	Counter 3	Dig IN	P3 Counter 3 Input	P3 pin 35
B28	Counter 2	Dig IN	P3 Counter 2 Input	P3 pin 17
A29	Counter 1	Dig IN	P3 Counter 1 Input	P3 pin 36
B29	Counter 0	Dig IN	P3 Counter 0 Input	P3 pin 18
A30	CD ACK-	Dig IN	Reserved	No Connection
B30	SDI	Dig IN	Reserved	No Connection
A31	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
B31	XI/O Gain 1	Dig OUT	Analog Expansion Gain Select bit 1	P1 pin 5
A32	XI/O Gain 0	Dig OUT	Analog Expansion Gain Select bit 0	P1 pin 6
B32	XI/O Address 3	Dig OUT	Analog Exp. Address Select bit 3	P1 pin 3
A33	XI/O Address 2	Dig OUT	Analog Exp. Address Select bit 2	P1 pin 22
B33	XI/O Address 1	Dig OUT	Analog Exp. Address Select bit 1	P1 pin 4
A34	XI/O Address 0	Dig OUT	Analog Exp. Address Select bit 0	P1 pin 23
B34	External SSH	Dig OUT	Analog Expansion Simultaneous Sample/Hold Signal	P1 pin 26
A35	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
B35	Positive Ref	Analog	Analog +5 Volt Reference	P1 pin 9
A36	Negative Ref	Analog	Analog -5 Volt Reference	P1 pin 8
B36	Analog In Ch15	Analog	Analog Input Chan 15 (SE) Analog Input Chan 7L (DIF)	P1 pin 11
A37	Analog In Ch7	Analog	Analog Input Chan 7 (SE) Analog Input Chan 7H (DIF)	P1 pin 30
B37	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
A38	Analog In Ch14	Analog	Analog Input Chan 14 (SE) Analog Input Chan 6L (DIF)	P1 pin 12
B38	Analog In Ch6	Analog	Analog Input Chan 6 (SE) Analog Input Chan 6H (DIF)	P1 pin 31
A39	Ground	Analog	*Analog Signal Common*	*See Ground Tables*

This table is continued.

P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
B39	Analog In Ch13	Analog	Analog Input Chan 13 (SE) Analog Input Chan 5L (DIF)	P1 pin 13
A40	Analog In Ch5	Analog	Analog Input Chan 5 (SE) Analog Input Chan 5H (DIF)	P1 pin 32
B40	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
A41	Analog In Ch12	Analog	Analog Input Chan 12 (SE) Analog Input Chan 4L (DIF)	P1 pin 14
B41	Analog In Ch	Analog	Analog Input Chan 4 (SE) Analog Input Chan 4H (DIF)	P1 pin 33
A42	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
B42	Analog In Ch11	Analog	Analog Input Chan 11 (SE) Analog Input Chan 3L (DIF)	P1 pin 15
A43	Analog In Ch3	Analog	Analog Input Chan 3 (SE) Analog Input Chan 3H (DIF)	P1 pin 34
B43	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
A44	Analog In Ch10	Analog	Analog Input Chan 10 (SE) Analog Input Chan 2L (DIF)	P1 pin 16
B44	Analog In Ch2	Analog	Analog Input Chan 2 (SE) Analog Input Chan 2H (DIF)	P1 pin 35
A45	Signal Ground	Analog	Sense Common (SGND)	P1-19
B45	Analog In Ch9	Analog	Analog Input Chan 9 (SE) Analog Input Chan 1L (DIF)	P1 pin 17
A46	Analog In Ch1	Analog	Analog Input Chan 1 (SE) Analog Input Chan 1H (DIF)	P1 pin 36
B46	Ground	Analog	*Analog Signal Common*	*See Ground Tables*
A47	Analog In Ch8	Analog	Analog Input Chan 8 (SE) Analog Input Chan 0L (DIF)	P1 pin 18
B47	Analog In Ch0	Analog	Analog Input Chan 0 (SE) Analog Input Chan 0H (DIF)	P1 pin 37
A48	-15VDC	Power	Expansion -15 Volts	P1 pin 2 P3 pin 37
B48	+15VDC	Power	Expansion +15 Volts	P1 pin 21 P3 pin 19
A49	DAC 0	Analog	DAC 0 Output	P3 pin 34
B49 *	DAC 2	Analog	DAC 2 Output	P3 pin 32
A50	DAC 1	Analog	DAC 1 Output	P3 pin 33
B50 *	DAC 3	Analog	DAC 3 Output	P3 pin 31

* DAC 2 and DAC 3 (from P4 pins B49 and B50, respectively) only apply to DaqBoard/2001, /2003 /2004 and the equivalent cPCI DaqBoard/2000c Series Boards.

Ground Tables – P4 Pin to P1, P2, and P3 Ground Correlation

Digital Common (DGND)								
P4 Pin	**DBK200**	**DBK201**	**DBK202 DBK203 DBK204**	**DBK206**	**DBK207**	**DBK208**	**DBK209**	
A10	-------	-------	-------	P1-7	-------	-------	P1-7	**P1**
B14	-------	P2-11	P2-11	P2-11	-------	P2-11	P2-11	**P2**
A23		P2-13	P2-13	P2-13		P2-13	P2-13	
A24		P2-15	P2-15	P2-15		P2-15	P2-15	
B25		P2-17	P2-17	P2-17		P2-17	P2-17	
B27		P2-19	P2-19	P2-19		P2-19	P2-19	
		P2-21	P2-21	P2-21		P2-21	P2-21	
	-------	-------	P3-1	P3-1	-------	-------	P3-1	**P3**
		-------	P3-2	P3-2			P3-2	
		P3-11	P3-11	P3-11			P3-11	
		-------	P3-30	P3-30			P3-30	

Analog Common (AGND)								
P4 Pin	**DBK200**	**DBK201**	**DBK202 DBK203 DBK204**	**DBK206**	**DBK207**	**DBK208**	**DBK209**	
A31	P1-7	P1-7	P1-7	-------	P1-7	-------	-------	**P1**
A35	P1-28	P1-28	P1-28	P1-28	P1-28		P1-28	
B37	P1-29	P1-29	P1-29	P1-29	P1-29		P1-29	
A39	-------	-------	-------	-------	-------	-------	-------	**P2**
B40	-------	P3-30	-------	-------	-------	-------	-------	**P3**
A42								
B43								
B46								

Notes

CE-Compliance 4

Overview ……4-1
CE Standards and Directives …… 4-1
Safety Conditions ……4-2
Emissions/Immunity Conditions ……4-2
CE Enhancements for DBKs ……. 4-3
CE Cable Kits for DaqBoard/2000 Series and /2000c Series Boards…… 4-3

Overview

CE standards were developed by the European Union (EU) dating from 1985 and include specifications both for safety and for EMI emissions and immunity. Now, all affected products sold in EU countries must meet such standards. Although not required in the USA, these standards are considered good engineering practice since they enhance safety while reducing noise and ESD problems.

In contracted and in-house testing, most Daq* products met the required specifications. Those products not originally in compliance were redesigned accordingly. In some cases, alternate product versions, shield plates, edge guards, special connectors, or add-on kits are required to meet CE compliance.

CE-compliant products bear the "CE" mark and include a *Declaration of Conformity* stating the particular specifications and conditions that apply. The test records and supporting documentation that validate the compliance are kept on file at the factory.

CE Standards and Directives

The electromagnetic compatibility (EMC) directives specify two basic requirements:

1. The device must not interfere with radio or telecommunications.
2. The device must be immune from electromagnetic interference from RF transmitters, etc.

The standards are published in the *Official Journal of European Union* under direction of CENELEC (European Committee for Electrotechnical Standardization). The specific standards relevant to Daq* equipment are listed on the product's Declaration of Conformity and include: CISPR22:1985; EN55022:1988 (Information Technology Equipment, Class A for commercial/industrial use); and EN50082-1:1992 for various categories of EMI immunity.

The safety standard that applies to Daq* products is EN 61010-1 : 1993 (*Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements*). Environmental conditions include the following:

- indoor use
- altitude up to 2000 m
- temperature 5°C to 40°C (41°F to 104°F)
- maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- mains supply voltage fluctuations not to exceed ±10% of the nominal voltage
- other supply voltage fluctuations as stated by the manufacturer
- transient overvoltage according to installation categories (overvoltage categories) I, II and III For mains supply, the minimum and normal category is II
- pollution degree I or II in accordance with IEC 664

For clarification, terms used in some Declarations of Conformity include:

- **pollution degree**: any addition of foreign matter, solid, liquid or gaseous (ionized gases) that may produce a reduction of dielectric strength or surface resistivity. **Pollution Degree I** has no influence on safety and implies: the equipment is at operating temperature with non-condensing humidity conditions; no conductive particles are permitted in the atmosphere; warm-up time is sufficient to avert any condensation or frost; no hazardous voltages are applied until completion of the warm-up period. **Pollution Degree II** implies the expectation of occasional condensation.
- **overvoltage (installation) category**: classification with limits for transient overvoltage, dependent on the nominal line voltage to earth. **Category I** implies signals without high transient values. **Category II** applies to typical mains power lines with some transients.

Safety Conditions

Users must comply with all relevant safety conditions in the user's manual and the Declarations of Conformity. This manual and Daq* hardware make use of the following Warning and Caution symbols: If you see either of these symbols on a product, carefully read the related information and be alert to the possibility of personal injury.

This warning symbol is used in this manual or on the equipment to warn of possible injury or death from electrical shock under noted conditions.

This warning/caution symbol is used to warn of possible personal injury or equipment damage under noted conditions.

Daq* products contain no user-serviceable parts; refer all service to qualified personnel. The specific safety conditions for CE compliance vary by product; but general safety conditions include:

- The operator must observe all safety cautions and operating conditions specified in the documentation for all hardware used.
- The host computer and all connected equipment must be CE compliant.
- All power must be off to the device and externally connected equipment before internal access to the device is permitted.
- Isolation voltage ratings: do not exceed documented voltage limits for power and signal inputs. All wire insulation and terminal blocks in the system must be rated for the isolation voltage in use. Voltages above 30 Vrms or ±60 VDC must not be applied if any condensation has formed on the device.
- Current and power use must not exceed specifications. Do not defeat fuses or other over-current protection.

Emissions/Immunity Conditions

The specific immunity conditions for CE compliance vary by product; but general immunity conditions include:

- Cables must be shielded, braid-type with metal-shelled connectors. Input terminal connections are to be made with shielded wire. The shield should be connected to the chassis ground with the hardware provided.
- The host computer must be properly grounded.
- In low-level analog applications, some inaccuracy is to be expected when I/O leads are exposed to RF fields or transients over 3 or 10 V/m as noted on the Declaration of Conformity.

CE Enhancements for DBKs

The following CE enhancements are described in the individual document modules of the *DBK Cards and Modules User's Manual* (p/n 457-0905).

- DBK41/CE
- Edge Guard (for DBK5, DBK8, and DBK44)
- Applicable cables and connectors

CE Cable Kits for DaqBoard 2000 Series and /2000c Series Boards

CAUTION

Turn OFF the power to, and UNPLUG the host PC and externally connected equipment prior to removing the PC's cover and removing (or installing) the DaqBoard/2000 Series [or /2000c Series] Board. Electric shock or damage to equipment can result even under low-voltage conditions.

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

Note: The CE Cable Kit used with DaqBoard/2000 Series Boards is p/n CA-209.
The CE Cable Kit used with cPCI DaqBoard/2000c Series Boards is p/n CA-209c.

By following these instructions correctly, your DaqBoard/2000 Series [or /2000c Series] Board will be CE Compliant in accordance with the conditions stated on your board's Declaration of Conformity.

If your board is already installed, you will need to remove it from the PC before proceeding. If your board is not yet installed, proceed to the section entitled, ***Install the CE ORB***.

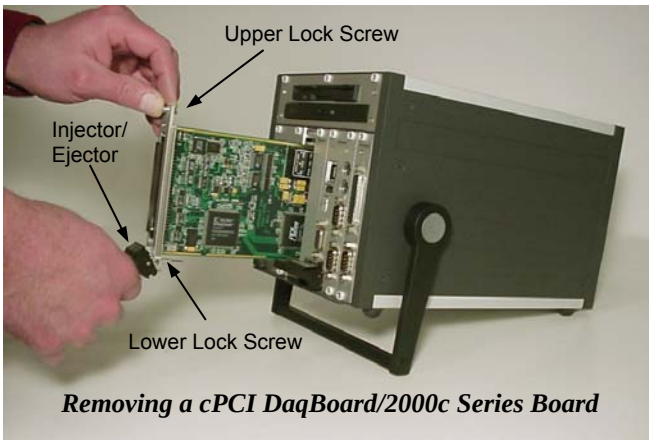
Remove DaqBoard/2000 Series or /2000c Series Board from the Host PC

For DaqBoard/2000 Series Boards [PCI type]

1. Turn the host PC's power **OFF**.
2. Turn **power OFF** to externally connected equipment.
3. **UNPLUG the host PC** and all externally connected equipment.
4. Remove the PC's cover. *Refer to your PC Owner's Manual as needed*.
5. Locate the DaqBoard/2000 Series Board and carefully remove the board from its PCI slot.

For cPCI DaqBoard/2000c Series Boards [cPCI Type]

1. Turn the compact PC's power **OFF**.
2. Turn **power OFF** to externally connected equipment.
3. **UNPLUG the compact PC** and all externally connected equipment.
4. Loosen the upper and lower lock screws (see figure).
5. Push the cPCI board's *injector/ejector* down to disengage the board.
6. Slide the board free of the compact PC.

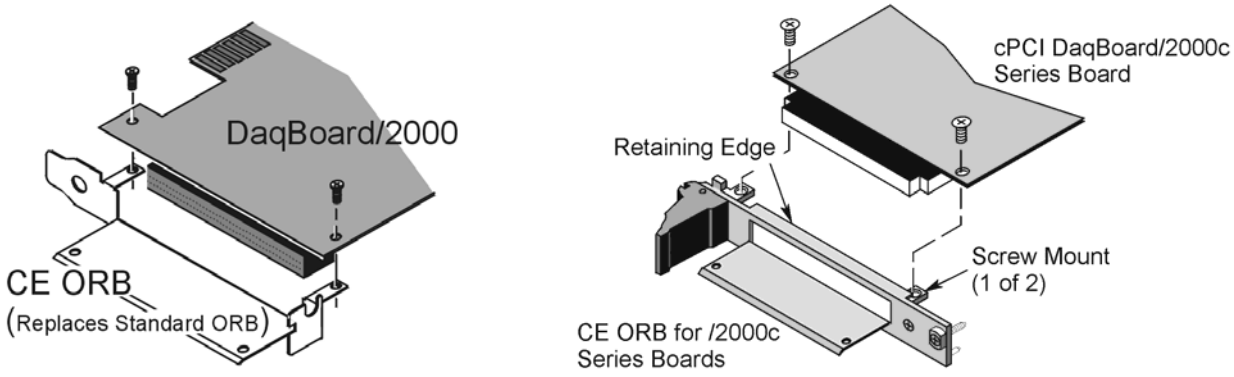


Removing a cPCI DaqBoard/2000c Series Board

Install the CE ORB

1. Remove the two screws that secure the standard [non-CE] ORB to the board (see figures).
2. Using the same screws, mount the CE ORB to the board. Tighten the screws snug, but do not over tighten.

Note: For the cPCI DaqBoard/2000c Series Boards, the board's edge will locate between the ORB's Retaining Edge and the two screw mounts.



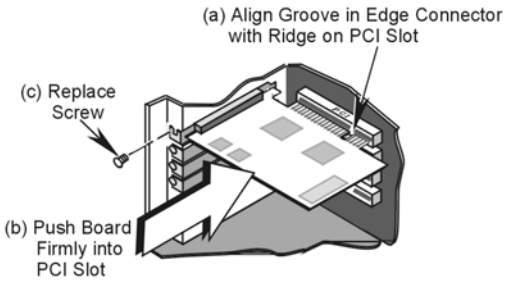
Mounting DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards to CE ORBs

Install the Board with its CE ORB

For DaqBoard/2000 Series Boards [PCI type]

If you a installing the DaqBoard/2000 Series Board for the first time, refer to chapter 1 of this manual; or to the DaqBoard/2000 Series Quick Start Guide, prior to installing the board.

1. *If you have not already done so*, turn **off** power to, and **UNPLUG the host PC** and externally connected equipment. Then remove the PC's cover. *Refer to your PC Owner's Manual as needed.*
2. Install the DaqBoard/2000 Series Board[with CE ORB] as follows:
   (a) Align the groove in the edge connector with the ridge on the PCI slot.
   (b) Push the DaqBoard/2000 Series Board firmly into the PCI slot.
   (c) Replace the rear panel adapter screw.
3. Replace the PC's cover.

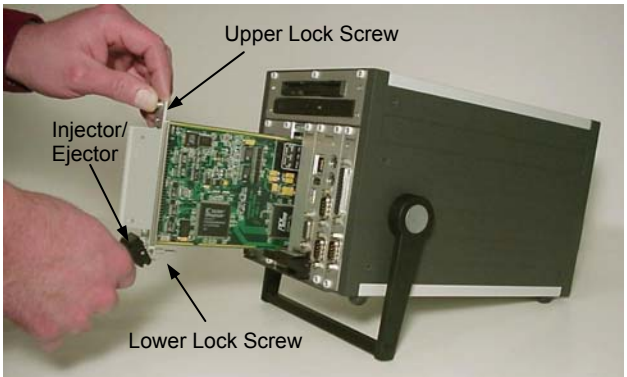


Installing a DaqBoard/2000 Series Board

For cPCI DaqBoard/2000c Series Boards [cPCI Type]

If you a installing the cPCI DaqBoard/2000c Series Board for the first time, refer to chapter 2 of this manual; or to the cPCI DaqBoard/2000c Series Quick Start Guide, prior to installing the board.

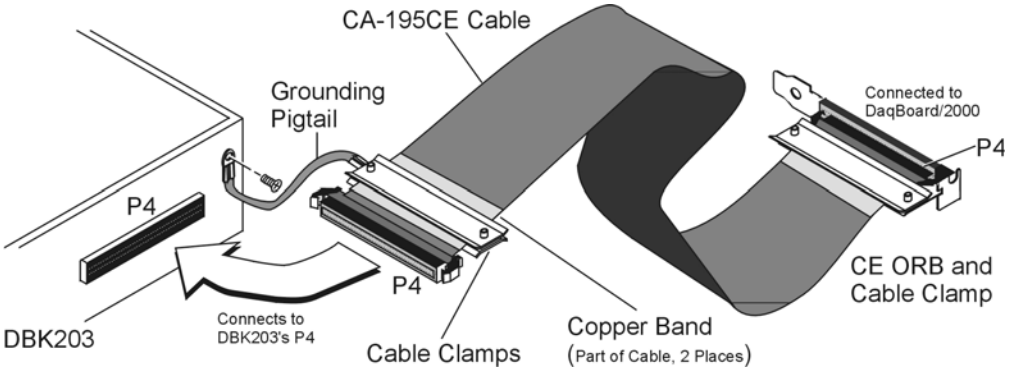
1. Turn the compact PC's power **OFF**.
2. Turn **power OFF** to externally connected equipment.
3. **UNPLUG the compact PC** and all externally connected equipment.
4. With the board's *injector/ejector* down, slide the board into the compact PC. Make sure you use the PCs card guides.
5. After the board is inserted, pull the cPCI board's *injector/ejector* up to engage the board.
6. Tighten the upper and lower lock screws.



Installing a cPCI DaqBoard/2000c Series Board

Connect the CA-195CE Cable to the Board

Note: This section includes illustrations depicting the DaqBoard/2000; but apply to both the DaqBoard/2000 Series Boards and the cPCI DaqBoard/2000c Series Boards.

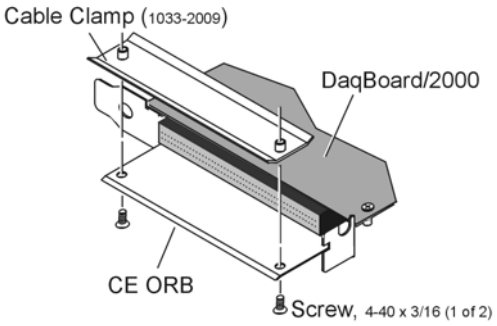


Note: When mating P4 connectors, ensure that the P4 white locator triangles point to each other. The triangles locate pin A1.

1. Connect one end of the CA-195CE Cable to DaqBoard/2000 Series [or /2000c Series] Board's P4 connector. Note that either end of the cable can be connected to the board; however, **the white locator triangles must align with each other**.

2. Align the Cable Clamp (1033-2009) with the CE ORB and secure the items with two 4-40 x 3/16 screws (provided).

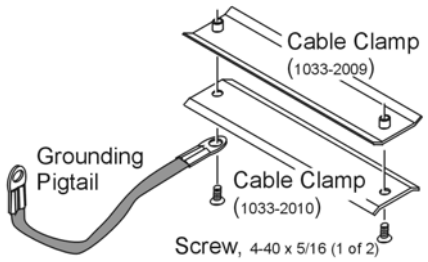
Note: In the right hand figure, the cable is not shown to allow for greater clarity of parts.



Secure the Grounding Pigtail to Cable CA-195CE

Using Cable Clamps 1033-2009, 1033-2010, and two 4_40 x 5/16 screws, secure the Grounding Pigtail to the cable. Note that the Clamps must be positioned over the cable's Copper Band as shown in the figure on page 4-5. Tighten screws snug, but do not over tighten.

Note: In the following figure, the cable is not shown to allow for greater clarity of parts.



Connect Cable and Grounding Pigtail to DBK203

Note: **DBK204** [for use with DaqBoard/2000 Series Boards] consists of a DBK203 and a CA-209 CE cable kit. **DBK204c** [for use with cPCI DaqBoard/2000c Series Boards] consists of a DBK203 and a CA-209c CE cable kit.

1. Verify correct P4 connector alignment of the CA-195CE Cable and DBK203's P4 connector.
2. Complete the connection.
3. Connect the open end of the Grounding Pigtail to the threaded insert located to the right of DBK203's P4 connector. See figure on page 4-5.

Note: When mating P4 connectors, ensure that the P4 white locator triangles point to each other. The triangles locate pin A1.

At this point your board will be CE compliant, providing that the conditions listed on your board's Declaration of Conformity are satisfied. You can return power to the system and commence with normal operation of your DaqBoard/2000 Series [or /2000c Series] Board.

Calibration 5

DaqBoard/1000 and /2000 Series boards are factory-calibrated. However, if adjustments are needed they should be completed in the following order:

1. PGA Input and Output Offset
2. Sample/Hold Offset
3. A/D Offset and Gain
4. VDC Voltage Reference
5. DAC0 Full-Scale*
6. DAC1 Full-Scale*
7. DAC2 Full-Scale*
8. DAC3 Full-Scale*

*In regard to the various DaqBoard/1000 and /2000 Series boards, DAC applicability is as follows:

DaqBoard/1000 – DAC0 and DAC1 apply
DaqBoard/1005 – No DACs apply
DaqBoard/2000 and /2000c– DAC0 and DAC1 apply
DaqBoard/2001 and /2001c– DAC0, DAC1, DAC2, and DAC3 apply
DaqBoard/2002 and /2002c– No DACs apply
DaqBoard/2003 and /2003c– DAC0, DAC1, DAC2, and DAC3 apply
DaqBoard/2004 and /2004c– DAC0, DAC1, DAC2, and DAC3 apply
DaqBoard/2005 and /2005c – No DACs apply

A Windows-based program, DaqCal.exe, is used to calibrate Daq systems, including analog expansion cards. DaqCal.exe is used in conjunction with:

- a 4.5-digit, digital multi-meter
- an adjustable voltage calibrator
- an ambient temperature meter.

To use the calibration program:

1. Launch **DaqCal**.

   Note: DaqCal is installed automatically from your data acquisition CD as a part of product support. This takes place during software installation. DaqCal's default location is the **IOtech DaqX Software** folder, in the **Programs** group.

2. When DaqCal opens you will be prompted to select your device from a list. After doing so, simply follow the illustrated on-screen instructions.

Notes

Specifications – DaqBoard/1000 Series Boards 6

I/O Comparison Matrix for DaqBoard/1000 Series Boards					
DaqBoard Identity	**Analog Input Channels**	**Analog Output Channels**	**Digital I/O Channels**	**Counter Inputs**	**Timer Outputs**
1000	16	2	24	4	2
1005	16	--	24	4	2

General Specifications **Applicable to DaqBoard/1000, /1005**

Warm-up: 1 hour to rated specifications
Supply voltage range: 4.75 VDC to 5.25 VDC (PCI bus)
Power consumption (per board): 3.5 W
Operating temperature: 0 to +60°C
Storage temperature: -40 to +80°C
Relative Humidity: 0 to 95% non-condensing
Vibration: MIL STD 810E
Signal I/O Connector: 68-pin SCSI type III, carries all analog I/O and digital I/O
Dimensions: 165 mm W x 15 mm D x 108 mm H (6.5" x 0.6" x 4.2")
Weight: 160 g (0.35 lbs)

Analog Inputs **Applicable to DaqBoard/1000, /1005**

Channels: 16 single-ended or 8 differential, programmable on a per-channel basis as single-ended or differential bipolar.
Bandwidth: 500 kHz
Settling Time: 5 μs maximum to 1 LSB for full-scale step
Maximum Input Voltage: +11V relative to analog common
Over-Voltage Protection: ±35V
Ranges: Software programmable via sequencer on a per-channel basis.

Voltage Range (Note 1)	Accuracy (Note 2) One Year, 0 to 35°C ±(% reading + % range)	Input Noise (Note 3) (LSB rms) 10 Hz to 200 kHz
	Absolute	Typical
-10 to +10 V	0.015+.005	1
-5 to +5 V	0.015+.005	1
-2.5 to +2.5 V	0.015+.005	1
-1.25 to +1.25 V	0.015+.005	2
-0.625 to +0.625 V	0.015+.008	2
-0.3125 to +0.3125 V	0.015+.008	3
-0.156 to +0.156 V	0.02+.008	3

Notes:
1) Specifications assume differential input single channel scan, 200 kHz scan rate, unfiltered.
2) Accuracy specification is exclusive of noise. Measurements were taken at P1.
3) Inputs shorted to signal ground (SGND). 8192 samples.

A/D Specifications **Applicable to DaqBoard/1000, /1005**

Type: Successive approximation, 200 kHz maximum conversion rate

Resolution: 16 bits

Conversion Time: 5 μs

Maximum Sample Rate: 200 kHz

Differential Nonlinearity: ±2 LSB maximum

Integral Nonlinearity: ±1 LSB maximum

Missing Codes: None, over full operating temperature range

Input Sequencer **Applicable to DaqBoard/1000, /1005**

Analog, digital and counter inputs can be scanned synchronously based either on an internal programmable timer, or an external clock source. Analog and digital outputs can be synchronized to either of these clocks.

Scan Clock Sources: 2

1. Internal, programmable from 5 μs to 5.96 hours maximum in 1 μs steps
2. External, TTL level input up to 200 kHz maximum

Programmable parameters per scan: channel (random order), gain

Depth: 512 location

On-board Channel to channel scan rate: 5 or 10 μs per channel, programmable

External Acquisition Scan Clock Input **Applicable to DaqBoard/1000, /1005**

Maximum rate: 200 kHz

Clock Signal Range: 0V to +5V

Minimum pulse width: 50 ns high, 50 ns low

Triggering **Applicable to DaqBoard/1000, /1005**

Trigger Sources:4, individually selectable for starting and stopping an acquisition. Stop acquisition can occur on a different channel than start acquisition; stop acquisition can be triggered via modes 2, 3, or 4 described below. Pre-trigger is supported with fixed or variable pre-trigger periods.

1. **Single-Channel Digital Trigger:** A separate digital input is provided for digital triggering. Latency: 5 μs max.
2. **Digital Pattern Triggering:** 8 or 16-bit pattern triggering on any digital input. Programmable for trigger on equal, above, below, or within or outside of a window. Individual bits can be masked for "don't care" condition. Latency: One scan period maximum.
3. **Counter/Totalizer Triggering:** Counter/totalizer inputs can trigger an acquisition. User can select to trigger on a frequency or on total counts that are equal, above, below, or within/outside of a window. Latency: One scan period maximum.
4. **Software Triggering:** Trigger can be initiated under program control.

Analog Outputs **Applicable to DaqBoard/1000; does not apply to DaqBoard/1005**

Two analog output channels are updated synchronously relative to scanned inputs, and clocked from either an internal onboard clock, or an external clock source. Analog outputs can also be updated asynchronously, independent of any other scanning in the system. Bus mastering DMA provides CPU and system-independent data transfers, ensuring accurate outputs that are irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous, nearly-infinite length, waveform outputs (limited only by available PC system resources).

Channels: 2 DAC channels (DAC0, DAC1)

Resolution: 16 bits

Output voltage range: ±10 V

Digital Feedthru: 50 mV when updated

Output current: ±10 mA

Offset error: ±0.0045 V maximum

Gain error: ±0.01%

Update rate: 100 kHz maximum, 1.5 Hz minimum (no minimum with external clock)

Settling Time: 10 μs maximum to 1 LSB for full-scale step

Clock Sources: 4 programmable

1. Onboard D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock
4. External scanning input clock

Digital I/O **Applicable to DaqBoard/1000, /1005**

Channels: 24, expandable to 208 with external DBK options

Input Scanning Modes: 2 programmable

1. Asynchronous, under program control at any time relative to input scanning
2. Synchronous with input scanning

Ports: 3 x 8-bit (82C55 emulation). Each port is programmable as input or output.

Input Characteristics: 100 Ω series, 20 pF to common

Input protection: ±8 kV ESD clamp diodes parallel

I/O levels: TTL

Sampling/Update rate: 200 kHz maximum

Output Characteristics: Output 12 mA per pin, 200 mA total continuous (per bank of 24 outputs)

Counters **Applicable to DaqBoard/1000, /1005**

Counter inputs can be scanned synchronously along with analog and digital scanned inputs, based either on internal programmable timer, or an external clock source. Bus mastering DMA provides CPU and system-independent data transfers, insuring data acquisition performance irrespective of other system activities. Counters can be configured to clear when read, or to totalize and clear under program control.

Channels: 4 x 16-bit, cascadable as 2 x 32-bit

Frequency Measurement Rate: 10 MHz maximum

Input Signal Range: -15 V to +15 V

Input Characteristics: 2.7 kΩ series in parallel with 20 pF to common and 10 kΩ to +5 V

Input protection: ±8 kV ESD clamp diodes parallel

Trigger Level: TTL

Minimum pulse width: 50 ns high, 50 ns low

Frequency/Pulse Generators **Applicable to DaqBoard/1000, /1005**

Channels: 2 x 16-bit
Output Waveform: Square wave
Output rate: 1 MHz base rate divided by 1 to 65535 (programmable)
High level output voltage: 2.0 V minimum @ -3.75 mA, 3.0 V minimum @ -2.5 mA
Low level output voltage: 0.4 V maximum @ 2.5 mA

Accessories and Cables **Applicable to DaqBoard/1000, /1005**

Termination Board (TB-100)
Termination board with screw terminals for accessing all I/O for one DaqBoard/1000 or DaqBoard/1005. The terminal board connects to the DaqBoard/1000 Series board's 68-pin connector via a CA-G56 cable.

Rack Mount Kit (Rack3)
This is a kit for mounting the TB-100 termination board to a rack.

68-Conductor Cable (CA-G56)
68-conductor, 3 ft. shielded cable. Used to connect a TB-100 terminal board to a DaqBoard/1000 or a DaqBoard/1005.

Manual Set (Set #1033), p/n 1033-0900

This is a hardcopy set of the following 3 manuals, available for purchase.

- *DaqBoard/1000 and /2000 Series User's Manual* (p/n 1033-0901)
- *Programmer's Manual* for developing custom programs using API commands (p/n 1008-0901)
- *DBK Option Cards & Modules User's Manual* (p/n 457-0905)
  Note: DaqBoard/1000 Series boards do not support DBK options.

Software **Applicable to DaqBoard/1000, /1005**

DaqView for setup, data acquisition display and analysis.

DaqViewXL for seamless execution within Microsoft Excel's tool palette.

eZ-PostView for post acquisition viewing and analysis.

I/O Comparison Matrix for DaqBoard/2000 Series Boards					
DaqBoard Identity	**Analog Input Channels**	**Analog Output Channels**	**Digital I/O Channels**	**Counter Inputs**	**Timer Outputs**
2000	16 ADC	2 DAC	40 Digital I/O	4	2
2001	16 ADC	4 DAC	40 Digital I/O	4	2
2002	--	--	40 Digital I/O	4	2
2003	--	4 DAC	--	--	--
2004	--	4 DAC	40 Digital I/O	4	2
2005	16 ADC	--	40 Digital I/O	4	2

General Specifications **Applicable to all DaqBoard/2000 Series Boards**

Warm-up: 1 hour to rated specifications

Supply voltage range: 4.75 VDC to 5.25 VDC (PCI bus)

Power consumption (per board): 3.5 W (up to 10 W with external accessories)

Power Available for External Signal Conditioning and Expansion Options:
5 V at 1 A (all boards); ±15 V at 75 mA each (with exception of DaqBoard/2002)

Operating temperature: 0 to +60°C

Storage temperature: -40 to +80°C

Relative Humidity: 0 to 95% non-condensing

Vibration: MIL Std 810E

Dimensions:

DaqBoard/2000 Series: 165 mm W x 15 mm D x 108 mm H (6.5” x 0.6” x 4.2”)

DaqBoard/2000c Series: 160mm W x 19 mm D x 100 mm H (6.3” x 0.7” x 3.9”)

Weight:

DaqBoard/2000 Series: 160 g (0.35 lbs)

DaqBoard/2000c Series: 178.95 g (0.39 lbs)

Analog Specifications **Applicable to DaqBoard/2000, /2001, /2005**

A/D: Successive approximation, 200 kHz maximum conversion rate
Resolution: 16 bits
Channels: 16 single-ended or 8 differential, expandable up to 256 differential
Conversion Time: 5 μs
Connector: 100-pin high-density edge-type
Missing Codes: None, over full operating temperature range

Input Voltage Ranges (software programmable via sequencer):			
Voltage Range	**Accuracy (Note 2) One Year, 0 to 35°C ±(% reading+% range)**	**Input Noise (LSB rms) 10 Hz-200 kHz (Note 3)**	**Notes**
	Absolute	**Typical**	(1) Specifications assume differential input single channel scan, 200 kHz scan rate, unfiltered.
0 to +10 V	0.015+.005	1	(2) Accuracy specification is exclusive of noise.
0 to +5 V	0.015+.005	1	(3) Inputs shorted to P4-45A, differential input, 8192 samples.
0 to +2.5 V	0.015+.005	1	
0 to +1.25 V	0.015+.008	2	
0 to +0.625 V	0.015+.008	2	
0 to +0.3125 V	0.015+.008	2	
-10 to +10 V	0.015+.005	1	
-5 to +5 V	0.015+.005	1	
-2.5 to +2.5 V	0.015+.005	1	
-1.25 to +1.25 V	0.015+.005	2	
-0.625 to +0.625 V	0.015+.008	2	
-0.3125 to +0.3125 V	0.015+.008	3	
-0.156 to +0.156 V	0.02+.008	3	

Voltage Specifications **(one year, 0-35°C)** **Applicable to DaqBoard/2000, /2001, /2005**

Differential Nonlinearity: ±2 LSB maximum
Integral Nonlinearity: ±1 LSB maximum
Temperature Coefficient: ±(10 ppm + 0.3 LSB)/°C typical
Input Impedance: 10 MΩ (single ended); 20 MΩ (differential), in parallel with 50 pF
Bias Current: <1 nA (0 to 35°C)
Common Mode Rejection: 86 dB typical, from DC to 60 Hz for gains ≤8; 95 dB typical, from DC to 60 Hz for gains ≥16
Hostile Channel-to-channel Crosstalk: 100 dB DC to 60 Hz; 86 dB @10 kHz
Maximum Input Voltage: ±11 V relative to analog common
Over-Voltage Protection: ±35 V relative to analog common

Input Sequencer **Applicable to DaqBoard/2000, /2001, /2002, /2004, /2005**

Analog, digital and counter inputs can be scanned synchronously based either on an internal programmable timer, or an external clock source. Analog and digital outputs can also be synchronized to either of these clocks. Bus Mastering DMA is utilized to provide CPU and system-independent data transfers, insuring data acquisition performance irrespective of other system activities.

Scan Clock Sources: 2

1. Internal, programmable from 5 μs to 5.96 hours maximum in 5 μs steps
2. External, TTL level input up to 200 kHz maximum

Programmable parameters per scan: channel (random order), gain, unipolar/bipolar

Depth: 512 locations

On-board Channel to channel scan rate: 5 or 10 μs per channel, programmable

Expansion channel scan rate: 5 or 10 μs per channel, programmable

External Acquisition Scan Clock Input **Applicable to DaqBoard/2000, /2001, /2005**

Maximum rate: 200 kHz

Signal Range: 0V to +5V

Input Characteristics: 100 Ω series, 20 pF to common and 10 kΩ to +5V

Input protection: ±8 kV ESD clamp diodes parallel

Trigger Level: TTL

Slew Rate Requirement: 14 V/μs minimum

Minimum pulse width: 50 ns high, 50 ns low

Triggering **Applicable to DaqBoard/2000, /2001, /2005**

Trigger Sources: 6, individually selectable for starting and stopping an acquisition. Stop acquisition can occur on a different channel than start acquisition; stop acquisition can be triggered via modes 2, 4, 5, or 6 described below. Pre-trigger is supported with fixed or variable pre-trigger periods.

1. Single-Channel Analog Hardware Trigger: Any analog input channel can be software programmed as the analog trigger channel, including any of the 256 analog expansion channels.

Input Signal Range: Anywhere within range of the selected input channel

Trigger level: Programmable (11-bit resolution), including “window triggering.”

Hysteresis: Programmable (11-bit resolution)

Latency: 5 μs maximum

2. Single-Channel Analog Software Trigger: Any analog input channel, including any of the 256 analog expansion channels, can be selected as the software trigger channel. If the trigger channel involves a calculation, such as with temperature, then the driver automatically compensates for the delay required to calculate the reading, resulting in a maximum latency of one scan period.

Input Signal Range: Anywhere within the range of the selected trigger channel

Trigger level: Programmable (16-bit resolution), including “window triggering”

Latency: One scan period maximum

3. Single-Channel Digital Trigger: A separate digital input is provided for digital triggering

Input Signal Range: -15V to +15V

Trigger level: TTL

Minimum pulse width: 50 ns high, 50 ns low

Latency: 5 μs maximum

4. Digital Pattern Triggering: 8 or 16-bit pattern triggering on any of the digital input ports. Programmable for trigger on equal, above, below, or within or outside of a window. Individual bits can be masked for "don't care" condition.

Latency: One scan period maximum

5. Counter/Totalizer Triggering: Counter/totalizer inputs can trigger an acquisition. User can select to trigger on a frequency or on total counts that are equal, above, below, or within/outside of a window.

Latency: One scan period maximum

6. Software Triggering: Trigger can be initiated under program control.

Analog Output **Applicable to DaqBoard/2000, /2001, /2003, /2004**

The analog output channels are updated synchronously relative to scanned inputs, and clocked from either an internal onboard clock, or an external clock source. Analog outputs can also be updated asynchronously, independent of any other scanning in the system. Bus mastering DMA provides CPU and system-independent data transfers, ensuring accurate outputs that are irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous, nearly-infinite length, waveform outputs (limited only by available PC system resources).

Channels: DaqBoard/2000: 2 DAC channels (DAC0, DAC1)
DaqBoard/2001, /2003, /2004: 4 DAC channels each (DAC0, DAC1, DAC2, and DAC3)

Resolution: 16 bits

Output voltage range: ±10 V

Output current: ±10 mA

Offset error: ±0.0045 V maximum

Digital Feedthru: 50 mV when updated

Gain error: ±0.01%

Update rate: 100 kHz maximum, 1.5 Hz minimum (no minimum with external clock)

Settling Time: 10 μs maximum to 1 LSB for full-scale step

Clock Sources: 4

1. Onboard D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock
4. External scanning input clock

Digital I/O **Applicable to DaqBoard/2000, /2001, /2002, /2004, /2005**

Channels: 40, expandable to 208 with external DBK options

Input Scanning Modes: 2

1. Asynchronous, under program control at any time relative to input scanning
2. Synchronous with input scanning

Ports: 3 x 8-bit (82C55 emulation), and 1 x 16-bit. Each port is programmable as input or output.

Input Characteristics: 100 Ω series, 20 pF to common

Input protection: ±8 kV ESD clamp diodes parallel

I/O levels: TTL

Sampling/Update rate: 200 kHz maximum

Pattern Generation Output **Applicable to DaqBoard/2000, /2001, /2002, /2004, /2005**

The P3 16-bit digital I/O port can be configured for 16-bit pattern generation. The pattern can be updated synchronously with an acquisition from a file. If pattern generation mode is utilized, then the D/A outputs can only be used in an asynchronous mode. Bus mastering DMA provides CPU and system-independent data transfers, insuring data acquisition performance irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous, nearly-infinite length, pattern outputs (limited only by available PC system resources)

Frequency/Pulse Generators **Applicable to DaqBoard/2000, /2001, /2002, /2004, /2005**

Channels: 2 x 16-bit

Output Waveform: Square wave

Output rate: 1 MHz base rate divided by 1 to 65535 (programmable)

High level output voltage: 2.0 V minimum @ -3.75 mA, 3.0 V minimum @ -2.5 mA

Low level output voltage: 0.4 V maximum @ 2.5 mA

Frequency/Pulse Counters **Applicable to DaqBoard/2000, /2001, /2002, /2004, /2005**

Counter inputs can be scanned synchronously along with analog and digital scanned inputs, based either on internal programmable timer, or an external clock source. Bus mastering DMA provides CPU and system-independent data transfers, insuring data acquisition performance irrespective of other system activities. Counters can be configured to clear when read, or to totalize and clear under program control.

Channels: 4 x 16-bit, cascadable as 2 x 32-bit

Input rate: 10 MHz maximum

Input Signal Range: -15 V to +15 V

Input Characteristics: 2.7 kΩ series in parallel with 20 pF to common and 10 kΩ to +5 V

Input protection: ±8 kV ESD clamp diodes parallel

Trigger Level: TTL

Minimum pulse width: 50 ns high, 50 ns low

Included Accessories and Software **for DaqBoard/2000 Series**

Software: *Windows Drivers (32-bit), 90-day Getting Started DaqView*

Hardware: DBK205 *is included with only DaqBoard/2003 and DaqBoard/2003c*. This adapter option provides screw-terminal access to the board's four analog outputs (DAC0, DAC1, DAC2, and DAC3), 1 digital ground, 5 analog grounds, an external clock (CLK), and an external trigger (XTTL).

Optional Accessories for DaqBoard/2000 Series

Software: DaqView including drivers for DasyLab and LabView, eZ-PostView post-acquisition software**,** DasyLab

Hardware:

CA-37-x - Expansion cable. The "x" indicates number of devices on expansion side, for example, CA-37-1 is a DB37-to-DB37 cable that provides expansion to 1 card. CA-37 cables are used to connect from P1 to P1, P2 to P2, or P3 to P3.

CA-195 - Interconnect cable, 3-ft, 100-conductor, mates with all above options and with DaqBoard/2000 Series P4 connectors.

DBK200 - Adapter panel, for connection of DBK signal conditioning and expansion options (analog)

DBK201 - Adapter panel, connects DBK signal conditioning and expansion options

DBK202 - Adapter panel with screw terminals, connects DBK signal conditioning and expansion options

DBK203 - Adapter module with screw terminals, connects DBK signal conditioning and expansion options

DBK204 - Consists of a DBK203 and a CA-209 CE cable kit for meeting CE compliance

DBK205 - This adapter provides screw-terminal access to DaqBoard/2003's [and DaqBoard/2003c's] four analog outputs (DAC0, DAC1, DAC2, and DAC3) 1 digital ground, 5 analog grounds, an external clock (CLK), and an external trigger (XTTL).

DBK206 - Screw-terminal board suitable for both analog and digital expansion. It provides three DB37 connectors
(P1, P2, and P3) and corresponding terminal blocks.

DBK207 - Carrier board for 5B-compatible analog input modules. The DBK207 board includes two P1 connectors for analog expansion, a power connection terminal, and 16 signal terminal blocks.

DBK207/CJC - Carrier board for 5B-compatible analog input modules. The DBK207 board includes two P1 connectors for analog expansion, a power connection terminal,
16 signal terminal blocks, and cold junction sensors for cold junction compensation (CJC) for thermocouple applications.

DBK208 - Carrier board for Opto-22 compatible solid-state-relay (SSR) digital modules. The DBK208 board includes two P2 connectors for digital expansion, a power connection terminal, and 16 signal terminal blocks.

DBK209 - mini-adapter board suitable for both analog and digital expansion. The board provides three DB37 connectors (P1, P2, and P3).

DBK210 - 32 channel digital I/O carrier board. The DBK210 provides: two P2 connectors, one P1 connector, footprints for 32 optically-isolated Grayhill 70M-Series mini-modules, a 100-pin P4 connector, and 4 removable screw terminal blocks. Each block supports 8 mini-modules.

DIN-DBK-1 – DIN-rail mount kit for DBK206, DBK207, and DBK208 applications.

Rack-DBK-3 – Rack mount kit for DBK206, DBK207, DBK208, and DBK209 applications.

Manuals

Manual Set (Set #1033), p/n 1033-0900.
This is a hardcopy set of manuals that is available for purchase.
The set includes the following three manuals.

DaqBoard/1000 and /2000 Series User's Manual (p/n 1033-0901)

Programmer's Manual for developing custom programs using API commands.
(p/n 1008-0901)

DBK Option Cards & Modules User's Manual (p/n 457-0905)

Glossary

Acquisition — A collection of scans acquired at a specified rate as controlled by the sequencer.

Analog — A signal of varying voltage or current that communicates data.

Analog-to-Digital Converter (ADC) — A circuit or device that converts analog values into digital values, such as binary bits, for use in digital computer processing.

API — Application Program Interface. The interface program within the Daq system's driver that includes function calls specific to Daq hardware and can be used with user-written programs (several languages supported).

Bipolar — A range of analog signals with positive and negative values (e.g., -5 to +5 V); see *unipolar*.

Buffer — *Buffer* refers to a circuit or device that allows a signal to pass through it, while providing isolation, or another function, without altering the signal. *Buffer* usually refers to:

(a) A device or circuit that allows for the temporary storage of data during data transfers. Such storage can compensate for differences in data flow rates. In a FIFO (First In - First Out) buffer, the data that is stored first is also the first data to leave the buffer.

(b) A follower stage used to drive a number of gates without overloading the preceding stage.

(c) An amplifier which accepts high source impedance input and results in low source impedance output (effectively, an impedance buffer).

Buffer Amplifier — An amplifier used primarily to match two different impedance points, and isolate one stage from a succeeding stage in order to prevent an undesirable interaction between the two stages. (Also see, *Buffer*).

Channel — In reference to Daq devices, *channel* simply refers to a single *input*, or *output* entity.

In a broader sense, an *input channel* is a signal path between the transducer at the point of measurement and the data acquisition system. A channel can go through various stages (buffers, multiplexers, or signal conditioning amplifiers and filters). Input channels are periodically sampled for readings.

An *output channel* from a device can be digital or analog. Outputs can vary in a programmed way in response to an input channel signal.

Common mode — Common mode pertains to signals that are identical in amplitude and duration; also can be used in reference to signal components.

Common mode voltage — Common mode voltage refers to a voltage magnitude (referenced to a common point) that is shared by two or more signals. *Example*: referenced to common, Signal 1 is +5 VDC and Signal 2 is +6 VDC. The common mode voltage for the two signals is +5.5 VDC [(5 + 6)/2].

Crosstalk — An undesired transfer of signals between systems or system components. Crosstalk causes signal interference, more commonly referred to as *noise*.

Digital — A digital signal is one of discrete value, in contrast to a varying signal. Combinations of binary digits (0s and 1s) represent digital data.

Digital-to-Analog Converter (DAC) A circuit or device that converts digital values (binary bits), into analog signals.

DIP switch A DIP switch is a group of miniature switches in a small *Dual In-line Package* (DIP). Typically, users set these switches to configure their particular application.

Differential mode The differential mode measures a voltage between 2 signal lines for a single channel. (Also see *single-ended mode*).

Differential mode voltage Differential mode voltage refers to a voltage difference between two signals that are referenced to a common point. Example: Signal 1 is +5 VDC referenced to common. Signal 2 is +6 VDC referenced to common.

If the +5 VDC signal is used as the reference, the differential mode voltage is +1 VDC (+ 6 VDC - +5 VDC = +1 VDC).

If the +6 VDC signal is used as the reference, the differential mode voltage is -1 VDC (+ 5 VDC - +6 VDC = -1 VDC).

ESD Electrostatic discharge (ESD) is the transfer of an electrostatic charge between bodies having different electrostatic potentials. This transfer occurs during direct contact of the bodies, or when induced by an electrostatic field. ESD energy can damage an integrated circuit (IC).

Excitation Some transducers [e.g. strain gages, thermistors, and resistance temperature detectors (RTDs)] require a known voltage or current. Typically, the variation of this signal through the transducer corresponds to the condition measured.

Gain The degree to which an input signal is amplified (or attenuated) to allow greater accuracy and resolution; can be expressed as ×n or ±dB.

Isolation The arrangement or operation of a circuit so that signals from another circuit or device do not affect the *isolated* circuit.

In reference to Daq devices, *isolation* usually refers to a separation of the direct link between the signal source and the analog-to-digital converter (ADC). Isolation is necessary when measuring high common-mode voltage.

Linearization Some transducers produce a voltage in linear proportion to the condition measured. Other transducers (e.g., thermocouples) have a nonlinear response. To convert nonlinear signals into accurate readings requires software to calibrate several points in the range used and then interpolate values between these points.

Multiplexer (MUX) A device that collects signals from several inputs and outputs them on a single channel.

Sample (reading) The value of a signal on a channel at an instant in time. When triggered, the ADC reads the channel and converts the sampled value into a 12- or 16-bit value.

Scan A series of measurements across a pre-selected sequence of channels.

Sequencer A programmable device that manages channels and channel-specific settings.

Simultaneous Sample-and-Hold An operation that gathers samples from multiple channels at the same instant and holds these values until all are sequentially converted to digital values.

Single-ended mode The single-ended mode measures a voltage between a signal line and a common reference that may be shared with other channels. (Also see *differential mode*).

Trigger An event to start a scan or mark an instant during an acquisition. The event can be defined in various ways; e.g., a TTL signal, a specified voltage level in a monitored channel, a button manually or mechanically engaged, a software command, etc. Some applications may use pre- and post-triggers to gather data around an instant or based on signal counts.

TTL Transistor-Transistor Logic (TTL) is a circuit in which a multiple-emitter transistor has replaced the multiple diode cluster (of the diode-transistor logic circuit); typically used to communicate logic signals at 5 V.

Unipolar A range of analog signals that is always zero or positive (e.g., 0 to 10 V). Evaluating a signal in the right range (unipolar or bipolar) allows greater resolution by using the full-range of the corresponding digital value. See *bipolar*.